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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

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C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
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Mr. Arthur H. Rice on December 28, 1915, succeeded Mr. Albert Waterhouse as president of the Board of Agriculture and Forestry. Mr. Waterhouse has served most ably and has devoted much time and valuable thought to the work of the Board during the past year, and it is to the regret of all that he has been compelled to resign the presidency on account of an anticipated protracted absence from the Territory. On the other hand, Mr. Rice's familiarity with the livestock and other agricultural industries in these islands, and his knowledge of the general work of the Board, well qualify him for his new position.

It is a disappointment that the handsome wicker settee made from willows grown at the Makiki Experiment Garden and placed on exhibition at Coyne's during November, together with the offer of the Division of Forestry to supply cuttings to all who desired to grow this willow for the making of wicker articles, failed to elicit one single inquiry of interest. The demand in these islands for wicker furniture, which is most suitable for this climate but which is now imported largely from Connecticut at great cost, offers a lucrative opportunity for a few energetic parties.

The diminution of wild goats and sheep, the consequent rehabilitation of native grasses and weeds, and the rapid spread of the algaroba over a large part of the island of Kahoolawe, together with the success already attained in the establishment of highland ironwood trees and the valuable fodder and soil-binding grass, *Paspalum dililatum*, on parts of this somewhat barren island, already seem to justify its creation as a forest reserve.

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The appointment in November, 1915, of two new forest rangers, E. H. Hipple for Palolo, Manoa and Nuuanu valleys in the Honolulu Watershed forest reserve, Oahu, and John Pililaau for the forest reserves in the Waianae district, marks a distinct advancement in the better administration of the Territorial forest reserves toward which the Division of Forestry is striving.

The reduction in infantile mortality on Oahu from 26 in 1910-11 to 3 in 1914-15, as shown by the report of the Territorial Veterinarian, coincident with the inauguration and vigorous prosecution of the campaign to eradicate bovine tuberculosis from the Territory, is significant. With purer milk the babies have a better chance for life.

In his search for parasites on the melon fly, Field Entomologist David T. Fullaway spent September in Singapore, moved on to Buitenzorg, Java, and then to Bangalore, India. From last accounts he was on his way back to Manila.

In the effort to make Honolulu a more beautiful city the Board is coöperating with the City and County, through the Outdoor Circle, by furnishing manure and mahogany trees free of charge for the Kalakaua Avenue parking.

The fencing of the Territorial forests along the Volcano Road on Hawaii by the Division of Forestry, to keep out wandering stock, will preserve for the enjoyment of tourists from all parts of the world what remains of the charming native forest woodlands along this scenic ride.

The cloth notices posted by the Territorial Forester along conspicuous highways and trails on the Honolulu Watershed forest reserve have begun to make the people realize that this reserve was created for a definite and beneficial purpose.

The strict inspection made by the Division of Entomology of all fruit shipments from the Coast results in the placing of better fruit in better condition on the Honolulu market.

CORRECTED TREE PLANTING RECORD.

Honolulu, December 28, 1915.

Editor Hawaiian Forester and Agriculturist:

Sir:—Owing to typographical errors and omissions which occurred in the table showing the number of trees planted on all the islands during the calendar years of 1913 and 1914, which was printed on page 71 of the report of the Board of Commissioners of Agriculture and Forestry for the biennial period ended December 31, 1914, I beg to transmit the following corrected table which I should be glad to have appear in an early issue of the Hawaiian Forester and Agriculturist.

In order to obtain the full and correct number of trees planted during 1915, I am about to send out a reply postal card and it is my hope that this will be filled out by all tree planters in the Territory and promptly returned to this office.

Very sincerely yours,

C. S. JUDD,
Superintendent of Forestry.

NUMBER OF TREES PLANTED IN THE TERRITORY OF HAWAII, PRINCIPALLY BY CORPORATIONS, IN 1913 AND 1914.

Kauai.

	1913	1914	Total
Koloa Sugar Co.	11,199	5,901	17,100
McBryde Sugar Co.	17,839	17,839	35,678
Grove Farm Plantation.	25,000	65,000	90,000
Makee Sugar Co.	30,000	20.100	50,100
Papapaholahola Spring Reserve.	18,544	20,381	38,925
	102,582	129,221	231,803

Oahu.

Waialua Agricultural Co.	125,000	125,000	250,000
Honolulu Plantation Co.		30,000	30,000
	125,000	155,000	280,000

Hawaii.

Pacific Sugar Mill.		10,000	10,000
Hawaiian Agricultural Co.	7,000	7,000	14,000
Kukaiau Ranch	99,450	165,920	265,370
Parker Ranch	33,832	96,394	130,226
Kukaiau Plantation Co.	2,000	2,000	4,000

Niulii Sugar Mill and Plantation....		1,700	1,700
Honokaa Sugar Co.....	10,000	10,000	20,000
Puakea Plantation Co.....	580	580	1,160
Waiohinu Homesteads.....		2,000	2,000
Hilo District, from Hilo sub-nursery.	10,066	10,868	20,934
	162,928	306,462	469,390

Maui.

Maui Agricultural Co.....		255,035	255,035
Wailuku Sugar Co.....	19,661	29,261	48,922
Polipoli, government lands.....	4,653	11,187	15,840
Honolua Ranch	2,000	3,500	5,500
Cornwell Ranch		32,000	32,000
Lanai Company, Ltd.....	9,000	1,340	10,340
Haiku Homesteads.....	5,000	4,000	9,000
	40,314	336,323	376,637
Total number of trees planted on all islands	430,824	927,006	1,357,830

DIVISION OF ANIMAL INDUSTRY.

Honolulu, November 26, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to submit herewith my report on the work of the Division of Animal Industry for the month of October, 1915:

Bovine Tuberculosis.

The annual tuberculin testing of all dairy cattle in the City and County of Honolulu, as by municipal ordinance required, has nearly been finished, there remaining only some of the railroad ranches' cattle still to be submitted to the test. These untested cows can hardly be classified as dairy cattle, their milk being used for human consumption only in part and for a very limited period. Properly speaking the animals in question are range cattle, which, for the purpose of gentling the calves, are rounded up and handled for a varying length of time, from one month to six weeks, during which period their surplus milk is sometimes sold or otherwise disposed of for human consumption. So in order to comply with the above mentioned "milk ordinance" and at the same time obtain reliable information as to the health of the cows so far as bovine tuberculosis is concerned the not inconsiderable task of rounding up, confining, in-

jecting with tuberculin, inspecting, ear-marking or branding a few thousand half wild cows is gone through with, regularly, once a year. As tuberculosis occurs but very rarely among this class of animals, and as the quantity of milk obtained from them is too small to pay for the cost of the labor required the undertaking might, except for the gentling of the calves, be considered philanthropic, were it not for the few centers of tuberculous infection which thereby have been removed from these otherwise healthy herds. At any rate the tuberculin testing of such a large number of temporary milch cows, with only a fraction of one per cent. of infected animals among them, has caused a decided reduction in the figure of final results, highly satisfactory, though to a certain extent misleading. In other words the percentage of infection with bovine tuberculosis on the island of Oahu is annually lowered nearly one per cent. by counting the cows of the railroad ranches as dairy cattle instead of range cattle. At the present time, for instance, with all actual dairy herds tested, the percentage of infection is well above 4, though not reaching 4.5. With the railroad cows added, this figure will probably be reduced to between 3 and 3.5, which fact it has seemed desirable to emphasize in view of the unusual conditions discussed in my last report and which were responsible for the advance of this figure from 2.88 of last year.

In response to an invitation from the Hawaiian Medical Association a paper entitled, "Bovine Tuberculosis; Its Economic Importance; Territorial and Municipal Measures of Suppression and Eradication," was read at the annual meeting which was held in Honolulu during the first week of the present month. A copy of this paper is appended herewith for the information of the members of the board, and attention is especially called to the section pertaining to the enormous sum which the milk consuming public has paid the milk producers for condemned reacting cows. While the figures quoted (an increase in the price of milk of 2 cents per quart on 9000 quarts daily for five years) are very conservative, the question as to what part of the aggregate should be charged to increased cost of production remains open. Labor has undoubtedly increased in cost, but feed prices have not, so far as can be estimated by a comparison of prices, advanced sufficiently to warrant an increase of more than one cent per quart of milk. If this estimate is correct it is found that the consumer has paid an average of about $100 per head for each of the 1500 head of condemned reactors, in addition to which the owners have received an average of $25.00 per head for the carcasses.

The new "Sanitary Code" promulgated by the Territorial Board of Health under date of August 18, 1915, contains a paragraph of great importance to the work of eradicating bovine tuberculosis, in that it requires the tuberculin testing, by a government veterinarian, of all dairy cattle in the Territory before a license to sell milk can be issued. In other words, it extends the authority hitherto supplied on the island of Oahu alone by the

municipal milk ordinance to the entire Territory; and, while it apparently applies only to cows whose milk is to be sold, it is believed the code is sufficiently comprehensive to embrace also the family cow and private dairies from which milk is given away. It would, therefore, seem the time has come for a vigorous campaign against the tuberculous cow on the other islands, and especially on Hawaii and Kauai, where infantile tuberculosis during the year ending June 30, 1915, showed a mortality three times as large as that of Oahu (9 deaths as compared to 3), and more than twice as large during the two immediately preceding years. From figures furnished by the Territorial registrar general, the infantile mortality (children under 5 years of age) from tuberculosis amounted on Oahu alone to 26 cases in 1910-11, when the campaign against the tuberculous canvass was begun. As the vital statistics from the period previous to 1912 or 1913 were deficient and as the Anti-tuberculosis League had not yet commenced its educational campaign, many cases were undoubtedly never reported or else reported under headings other than tuberculosis. Beginning, however, with these 26 authentic deaths in 1910-11, the City and County of Honolulu shows the following reduction in mortality:

1910-11	26
1911-12	15
1912-13	8
1913-14	9
1914-15	3

In other words *where five years ago nine children died from tuberculosis only one died last year.*

On the other islands taken together, the corresponding figures show:

1910-11	18
1911-12	14
1912-13	17
1913-14	14
1914-15	9

In other words a reduction of two to one for these three counties, or for the entire Territory from 44 deaths in 1910-11 to 12 in 1914-15—approximately 4 to 1.

As a specific instance, and illustrating what even partial efforts at suppression may accomplish in the face of opposition, may be mentioned the island of Kauai. In 1913 the president of the Territorial Board of Health called our attention to the continued great mortality from tuberculosis among the children on Kauai, and suggested the possible cause to be the prevalence of bovine tuberculosis on that island. These facts were referred to the Deputy Territorial Veterinarian on Kauai, requesting him to

take such action in the matter as local circumstances would permit. The vital statistics for the island showed the following number of deaths from tuberculosis in children under five years:

1910-11	11
1911-12	10
1912-13	8

or in each case from two to three times as many deaths as on Maui and Hawaii together. The Deputy Veterinarian shortly reported having found about 25 per cent. of tuberculous cows in one of the largest dairies on the island, and their subsequent destruction. The mortality for the following years showed:

1913-14	2
1914-15	3

or, where previous to 1913 four or five babies died from tuberculosis, only one died after but partial cleaning up of the island.

It would seem that further proof would be superfluous, and still it may be as well here to quote from my paper before the Medical Association above referred to, in which a prominent English pathologist after careful microscopic examination of the excised glands of 72 children suffering from scrofulosis (tuberculous enlargement of the lymph glands of the neck) found 90 per cent. of the infection to be of bovine origin, and further proved that 85 per cent. of these children had been fed on milk from untested cows.

A circular letter to the Deputy Territorial Veterinarians on Hawaii, Maui and Kauai has been prepared and sent to them with instructions to coöperate with the local representative of the Territorial Board of Health on their respective islands in enforcing the new Sanitary Code. On Hawaii Dr. Elliot has already begun testing the dairy herds in Kohala and North and South Kona, having secured leave of absence from his duties in Hilo. He is accompanied by a Board of Health inspector who acts as advance agent, travelling several days ahead of him arranging dates and places for testing, and impressing upon the milk producers that no license to sell milk will be issued until a clean bill of health, based on the tuberculin test, has been issued by Dr. Elliot. While all dairy cows have already been tested in Hamakua, North and South Hilo, Kona and Kau, a retest will be required before the new license is forthcoming.

Kauai and Maui have not been heard from as yet, but energetic steps will no doubt be taken there also as soon as the fact is realized that the long wanted authority on which to act has now been supplied. That human life is being wasted and that no term less than criminal negligence can be applied to a continuation of conditions which tolerate the presence of tuberculous infection on premises where milk for human consumption is being produced,

must be realized and must be acted upon without further delay. The new Sanitary Code puts the official approval of the Territorial Board of Health on this Board's efforts at eradicating bovine tuberculosis, and the vital statistics of the Registrar General prove beyond doubt an immense decrease in the mortality among children from tuberculous infection, so, whether due to the elimination of the tuberculous cow or to the efforts of the Anti-Tuberculosis League, or to both, the time has come when these factors must be applied to the fullest extent, and with coöperation among the various sanitary authorities, it should not be long before the last remnant of bovine tuberculosis has finally been eradicated from the Territory.

The hog cholera situation being dealt with at length in the appended report by Dr. Case, it only remains to state that an investigation of the new method of vaccinating poultry against sore-head, roup or chicken pox is well under way and will be dealt with in a special article which is now being prepared for publication. It may be said, however, that results obtained so far look very promising and warrant the hope that this disease, which for years has acted as a check on the poultry industry of the Territory, may soon be under complete control.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, November 10, 1915.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry.

Sir:—I have the honor to submit the following report for the month of October, 1915:

Tuberculosis Control.

The following dairy cattle have been tuberculin tested during the past month:

Name	Total	Passed	Condemned
S. Okuma	9	9	0
William Meyer	20	20	0
T. F. Farm	103	89	14
W. P. Alexander	5	4	1
G. Ikedo	9	9	0
M. Nee	14	14	0
A. F. Cooke	9	8	1
J. M. Whitney	13	13	0
A. L. C. Atkinson	48	47	1

Name	Total	Passed	Condemned
College of Hawaii	22	21	1
M. Kawamura	7	7	0
Mills Schools	18	17	1
Oahu College	17	17	0
Frank Ralph	7	7	0
S. Tsumoto	8	8	0
M. Quintal	5	5	0
J. A. Vierra	3	3	0
A. N. Campbell	2	2	0
Lunalilo Home	21	21	0
J. P. Mendonca	11	11	0
D. Tello	2	2	0
F. L. Whitney	3	2	1
A. F. Cooke	1	1	0
Girls' Industrial School	7	7	0
John Gomes	6	6	0
T. Gouviera	3	3	0
M. M. Pedro	5	5	0
M. T. Brazon	13	13	0
J. A. Castro	8	8	0
John Alias	4	4	0
M. Pacheco	4	3	1
Salvation Army Home	5	4	1
K. Mitsunago	4	3	1
H. Focke	5	5	0
S. Tado	16	16	0
I. Morioto	7	7	0

From the above tabulated list it will be seen that a total of 444 head of dairy cattle were tested during the month, out of which number 421 were passed and tagged and 23 condemned and branded. Of the number of condemned animals, 7 have been slaughtered at the different abattoirs, tubercular lesions being found in every instance, and 16 are segregated awaiting slaughter.

Hog Cholera.

A number of inspections were made at different piggeries, as follows: 5 Chinese; 20 Japanese in Moiliili district, and at Pond's and Kawahara's beyond Leilehua, a total of 2200 head of hogs being examined.

In Moiliili almost without exception the hogs were in the finest condition and according to statements from the various owners no loss has occurred since three years ago—1912—when they all experienced heavy losses, many being wiped out of business entirely. While it may be said that correct information regarding loss is hard to obtain, all evidence goes to show that there is no loss occurring in these piggeries at the present

time from hog cholera. This statement must not be construed to mean that the organisms of hog cholera are not present in this district, as this could hardly be possible after such a severe outbreak as has been reported, and while undoubtedly there they are so attenuated in vitality as to cause no loss among the hogs.

Since the last outbreak of cholera in the above district there has been considerable improvement in the care of the animals and the sanitary and hygienic condition of their surroundings, this has had the effect of raising the vitality of the hogs to the point where they are able to resist the attenuated infection which may be present. No serum is used by any of the above hog raisers, in fact they have never heard of such a thing as serum.

The feed in every instance consisted of slop, rice bran or middlings, taro tops and pig weed in varying proportions. All slop is cooked together with the green stuff and afterward the grain is added.

In Kawahara's piggery very similar conditions prevail. There are in the neighborhood of 450 hogs, small and large, and with very few exceptions all are in fine condition. As far as I was able to learn no loss attributable to cholera has occurred in a long time. No serum is used. The sanitary and hygienic conditions could be greatly improved. Between 40 and 50 hogs averaging about 135 pounds each are shipped to the Honolulu market every month.

No slop is fed at the present time and in fact since Mr. Pond secured the contract for the Schofield Barracks swill. The feed now consists of a mixture of rolled barley and rice bran in the proportion of two bags of rice bran to one bag of barley together with a varying amount of green stuff of different kinds. The rolled barley is cooked before it is fed, the rice bran being added afterward and the green stuff fed as it is cut. Breeding sows and boars get only the rice bran and green stuff, no barley, only those pigs being fattened for market get the full mixture. They seem to do remarkably well on it, gaining weight rapidly.

At Mr. Pond's pig farm many improvements are taking place. Many new buildings are going up and rapid strides are being made in hygiene and sanitation. No cases of hog cholera have occurred in several months and to all appearances the outbreak is now under absolute control.

In conclusion it may be stated that while an attenuated form of cholera infection may be and probably is present in a number of districts on this island, the actual loss from this disease at the present time is practically nil.

Importation of Live Stock.

S. S. Manoa, San Francisco—10 cts. poultry.

S. S. Matsonia, San Francisco—2 cts. poultry, 3 dogs, 1 cat, J. F. Colburn; 1 ct. pigeons, P. Silva; 1 bx. white mice, U. S. L. Ex. Sta.; 1 dog, Wm. Dykes; 1 dog, L. Barnett.

S. S. Lurline, San Francisco—1 horse; Ant. Schmer; 4 cts. poultry, J. C. Rued; 1 ct. doves, E. O. Hall & Son; 7 Holstein cows, 1 Holstein bull, 2 hogs, Kamehameha Schools.

S. S. Wilhelmina, San Francisco—1 dog, Mrs. C. Meade; 15 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

BOVINE TUBERCULOSIS.

ITS RELATION TO PUBLIC HEALTH; MUNICIPAL AND TERRITORIAL CONTROL AND SUPPRESSION; ECONOMIC IMPORTANCE.

(Paper read by Dr. V. A. Nörgaard, Territorial Veterinarian, before the Hawaiian Medical Association, November, 1915.)

Mr. President, Members of the Association:

The past year has seen but insignificant changes as regards the medical profession's standpoint relative to the subject under discussion. Practically all scientific men consider the question as having been definitely settled in favor of the view that bovine tuberculosis is transmissible to human beings, and especially to children.

What remains to be determined is the actual percentage of cases due to the bovine infection, or, in other words, the public health importance of the bovine disease.

In spite of the general acceptance of the theory of transmissibility, there occasionally appear articles opposing this view, and especially in countries where the work of eradication of bovine tuberculosis is being pushed. In Sweden for instance, where Prof. John Wennerholm now for several years has endeavored to reduce the number of infected herds by means of the Bang system of segregation, an article has appeared covering the autopsy reports of not less than 7,630 children, which died during the first year of life at the Stockholm Municipal Hospital during the years 1842 to 1911. Six hundred and twenty-three cases showed tuberculous lesions, of which number only six showed lesions exclusively in the intestines and mesenteric glands. In thirty years' experience, says the writer, (Prof. Wedin in Arch. f. Kinderh., 1913) he has never seen a case of tuberculosis which he could ascribe to infection through milk.

This paper is quoted by Dr. Ravenel at the last meeting of the American Association of Medical Milk Commissions for the purpose of warning against that sort of testimony. "Bacteriological examination," he continued, "has proven the impossibility of detecting bovine tuberculosis clinically. It is also impossible to

determine the portal of entrance by what appears post-mortem to be the oldest lesions. It has further been proven—by Baumgarten, twenty years ago—that the tubercle bacillus can penetrate the mucous membrane of the intestine and reach the lung without causing lesions at the point of entrance."

Prof. Wedin's paper is, therefore, of importance only as illustrating the kind of reasoning which has led to so much error on this question in the past.

In straight contrast to this is a paper by Dr. A. P. Mitchell (British Med. Journal, Jan., 1914), covering the examination of the cervical glands of 72 scrofulous children under 12 years of age. He summarizes his results as follows:

0-8 years—human, 4; bovine, 30.
5-12 years—human, 3; bovine, 35.

And adds that 84 per cent. of the cases two years old or under were fed on unsterilized cow's milk. "This," says Dr. Ravenel, "illustrates strikingly that in addition to the deaths caused in children by the bovine tubercle bacillus, a very large percentage of the tuberculous deformities also come from the same source."

The importance of bovine tuberculosis must therefore be considered a factor of immense importance in so far as public health is concerned, and as pasteurization alone has been found impossible of enforcement, our efforts must be bent on suppression and eradication of the source of infection.

Tuberculin Testing of Dairy Cattle in the City and County of Honolulu and in the Territory.

The past year did not prove favorable to the work of eradicating bovine tuberculosis, as undertaken and adhered to by the Board of Agriculture and Forestry since 1910.

By the end of 1914 a point had been reached which seemed to justify our hopes that complete eradication, at least in so far as the island of Oahu was concerned, was within reach. The number of reacting animals had been reduced to nearly 2 per cent. from more than 30 per cent., and with the removal of these last reactors to the slaughter house and the disinfection of the premises where they had been kept, it was believed that the time had come when complete eradication might be accelerated by encouraging those dairymen who still had the infection in their herds, to closer coöperation with the Board of Agriculture and Forestry by obtaining financial support from the legislature then shortly to convene. With this end in view, a bill providing for the indemnification of owners of tuberculous cattle was prepared and introduced, and it is believed was favorably received and promised support to the extent of $10,000. This sum would have been sufficient to greatly relieve the few dairy owners whom it was thought still had any considerable number of diseased animals in their stables. But, to the surprise of everybody concerned, the bill was killed in committee by the very people for the benefit

of whom it was conceived. A bill substituting pasteurization for the tuberculin test, or leaving the choice of either method to the individual dairyman, was considered but failed of acceptance.

In the meantime the regular tuberculin test of a number of dairies had been postponed from time to time until a point was reached where the Board of Agriculture and Forestry was confronted with the question of either abandoning the work so well begun and so nearly finished, or else obtain the enforcing of the municipal milk ordinance which requires that cows furnishing milk for human consumption must be free from tuberculosis. The dairymen yielded and testing was resumed, and the results demonstrated clearly how little time it takes for the tubercular infection to spread through a herd so long as a trace of it is left. Several of the dairies which had not been tested for a year to a year and a half showed from fifteen to twenty-five per cent. reactors, while one of the largest dairies where the infection had been almost universal from the beginning but where testing had been continued regularly, showed the smallest number of reactors on record, slightly more than one per cent. out of several hundred animals. It was also demonstrated that practically every dairy where the disease had once been cleaned out and where care had been exercised in not introducing any but healthy tested animals, remained free from the disease. This goes to prove that when once eradicated the disease must be brought in from abroad in order to gain a new foothold here, and that can, with our present laws and regulations, be prevented, the same as has been done in the island of Jersey these many years.

The work of eradication is now well under way again, and while the annual crop of reactors will more than double that of the preceding year, there is every reason to believe the ultimate object of complete eradication is not far distant even though its consummation has been delayed.

On the islands of Hawaii, Maui and Kauai, where no milk ordinance requiring the tuberculin test has been effective, the work of eradicating tuberculosis has of necessity been slower. Much good work has, however, been done, especially on Hawaii where the Deputy Territorial Veterinarian, Dr. Elliot, has been working hand in hand with the local Board of Health authorities. All dairy cattle in the Hamakua, Hilo, Puna and Kau districts have been tested and the reactors eliminated from the herds, and the work will soon be extended to the entire island. Considering the distance to be covered you will understand that this is no small undertaking for one man whose principal duties require his presence almost constantly in or near Hilo, but all of you who know Dr. Elliot also know that he will accomplish it. That he is thoroughly interested in the work and understands the requirements and the ultimate aim of it is best demonstrated by reading his contribution to this paper.

On Maui and Kauai only such dairy herds have been tested as

the owners have volunteered or been persuaded to clean up. The large plantation dairies have nearly all been tested and many private owners have seen the necessity for eliminating the danger of infection through tuberculous milk. A new era will undoubtedly begin with the enforcement of the

Sanitary Code of the Territorial Board of Health of August 18, 1915.

This code requires the testing for tuberculosis of all cows in the Territory whose milk is sold for human consumption. While it leaves out the private owner and protects the family cow against the test, it will, nevertheless, be of immense support in the work of eradication. Had this code been promulgated a few years ago, the Territory would, in my opinion, have been free of tuberculosis by this time. But late is better than never, and I have great hopes that the new code will prevent any such delays in the work as that already described. The Territory is now actually in the fight against this dangerous though preventable disease, and the authority which the code lends to those upon whom the actual work of eradication falls cannot be overestimated.

Infantile Mortality from Tuberculosis.

In my paper before the Association last year I mentioned the apparent decrease in the number of deaths among infants under five years of age, which appears to have occurred in the City and County of Honolulu coincidentally with the elimination of the tuberculous infection from the market milk. This decrease seems to be accentuated through the latest report of the Registrar General, if I interpret the figures furnished me correctly. In this connection it may be mentioned that similar observations have been made in other countries, notably England, where the health authorities in Leeds and Manchester both agree that a notable decrease in infantile tuberculosis has occurred in direct proportion to elimination of the tuberculous cow. The Manchester method, which consists in tuberculin testing and removal from the dairies of the reactors, in constantly widening circles or by definite districts, is accepted as most practical in many parts of England, and the results have been most gratifying, especially where eradication has gone hand in hand with pasteurization. This means that where, for economic reasons, all reactors cannot be destroyed at once, they are segregated and their milk pasteurized before it can be used for human consumption. Board of Health statistics from Leeds, Manchester and other cities where practiced, have shown so decided a decline in the mortality of children under five years of age that it exceeded that of many smaller but wealthy municipalities where social uplift clubs and anti-tuberculous leagues claimed the reduction due to the better

sanitary conditions in the homes of the laboring classes, resulting from their work, there is still a margin of lessened mortality from infantile tuberculosis which can be observed only in those districts where the tuberculous infection has been reduced or entirely removed from the market milk, whether by testing or by pasteurization, a fact which is easily understood when we recall Dr. Mitchell's already quoted statement that 84 per cent. of children under 2 years of age and suffering from scrofulosis were fed on unpasteurized milk and showed infection with the bovine form of the tubercle bacillus. Similar observations made by Dr. Park of New York and by many other prominent investigators were quoted in my paper before this Association last year, and Dr. Mitchell's observations may, therefore, be considered as confirming these. With such evidence before us, we can no longer afford to quibble and waste time on recalcitrant obstructionists, who in most cases are endeavoring to further personal aims or ambitions by appearing to champion the cause of the overburdened milk producer who cannot "afford" to rid his herd of tuberculous cows.

That bovine tuberculosis can be eradicated without actual loss to the milk producer and without indemnifying the owner of condemned cows out of public funds, has been amply demonstrated here. With the passing of the municipal milk ordinance of the City and County of Honolulu in 1910, it became a misdemeanor to sell milk from cows affected with tuberculosis and to obtain a license to sell milk the applicant must present a certificate showing that his herd had been tested with tuberculin and found free from tuberculosis. While the ordinance provided that the test should be made without cost to the owner, no provision was made for the disposal of the reacting animals or for the reimbursement of the owner who had to send a greater or less percentage of his herd to the slaughter house. The dairymen consequently did the only possible thing that could be done in the premises, that is, they raised the price of milk. If the milk consuming public wanted milk from tuberculin tested herds they must pay for it. Whether this point of view was correct is a question. The milk consumer undoubtedly received the most direct benefit from the measure, but being preliminarily a public health measure, originated and enforced by government officers, and one of grave import to the entire community, whether milk consumer or not, the question as to whether the consumer alone should pay for the protection of the entire community naturally presents itself. The demand for clean milk was, however, so strong that the increase of 25 per cent. in the cost of milk to the consumer caused but little objection and apparently had little effect upon the quantity consumed. Milk rose in price from 10 cents to 12½ cents per quart in Honolulu, a few independent milk producers, mostly Orientals, selling at 12 cents flat. With an average consumption of 9000 quarts per day an increase of but 2 cents per quart would mean $160.00 every day, or $65,700.00 per annum paid by the

milk consumer for milk from tuberculin tested cows. During the five years which have been devoted to eradication of the tuberculous dairy cow, an aggregate of 1500 condemned reactors have been butchered. For these animals the milk consumers have paid $328,500.00 or $219.00 per head. As the carcasses of these animals have realized the owners at least $20.00 each, it would appear that if these $239.00 per head could all be charged as paid by the consumer for condemned cattle exclusively, the milk producer had been well paid. Such, however, is not the case. The cost of production of milk has increased considerably during the period under consideration, and it is possible that had it not been for the already very high price of milk, and a price which has been paid without complaint by the consumer so long as he thought his family was being actually protected against at least one source of infection from tuberculosis, the price would undoubtedly have been raised long ago. Allowing one cent per quart for the increased cost of production during the past five years, the average price paid for each condemned cow may be placed at $120.00, which is probably very close to the average for which these animals could have been replaced.

So, whether just or unjust, the consumer has tacitly agreed to pay for clean milk from healthy cows, and is entitled to get what he pays for. On the other hand the producer has repeatedly signified that he prefers to get his remuneration for condemned cows directly from the consumer, instead of by official appraisal and indemnification. And, finally, as existing statutes and regulations allow for no other solution of the subject, it would seem as if the way is now open for final eradication of bovine tuberculosis on the island of Oahu, and for the earnest extension of the work to the other islands. I, therefore, wish in conclusion to ask all the members of this Association to help along, whenever the opportunity presents itself, to further the interest in and the demand for *clean milk* from *healthy cows*. One cent or two per day is a good investment if it prevents a case of tuberculosis in the family.

Discussion of Paper.

The discussion of Dr. Nörgaard's paper was opened by Dr. Sinclair.

Dr. Nörgaard, following Dr. Sinclair, said:

I wish to add only a few words in regard to the general milk supply of Honolulu at the present time.

To the most casual observer a great improvement in dairy sanitation and in the handling and care of the milk, as well as the animals, is plainly visible, especially if the observer was at all familiar with the conditions of five years ago. The constant visits of the tuberculin testing officials, a word of approval or praise, a timely suggestion of improvements as to methods and

means, or perhaps, in rare cases, a word of warning about unpleasant consequences if necessary improvements should not be forthcoming within a week, have in most cases worked toward a better understanding of the most elementary requirements for the production of clean milk and subsequently to an actual desire for improvements which hitherto had been regarded as unnecessary and expensive, evils to be dodged whenever possible. Many of the smaller Oriental dairies are now as clean as the proverbial dutch kitchen, and what counts heavier, on account of the larger numbers of cattle and the greater expense involved, quite a number of the larger dairies have either built entirely new barns or stables, or reconstructed and modernized the old ones. Among these should be mentioned Mr. Charles Bellina's and Mr. Frank Andrade's, the former being a new stable with 196 stanchions made of galvanized iron pipe set in a concrete foundation. A central feed alley is provided with rails on which move the feed cars. In the center of the stable is a turnstile by means of which the cars can be run to the various feed boxes, or else be filled with chopped green feed—alfalfa or Sudan grass from a storage room above, to which the feed is blown through tubes from the cutter located in a separate building beside the stable. The mangers are concrete with smooth cement surfaces, partitioned off for each cow with hinged galvanized iron partition which can be raised so as to allow the entire manger to be flushed clean with water. The floors are concrete, graded to the gutters, all of which slant to a general outlet from where the manure is flushed through pipes and flumes directly back to the alfalfa or Sudan fields. A great improvement has been made in the manner of collecting the milk, in that the large collecting cans (40 gallons) have been placed in enclosed boxes with sliding doors and situated on the outside of the rails behind the cows, but well out of range of the splash from the gutters and the swish of the tails. When full these containers are carried on a low truck to a wire conveyor on which they slide to the milk room some distance from the stable. Mr. Bellina is one of the largest milk producers in Honolulu at the present time, and great credit is due for his foresight and confidence in the future of the local milk problem.

The same may be said of Mr. Andrade, Mr. Lucas, Mr. Love and many others, and though much still remains to be done, there is evidence of progress in nearly every direction.

At this Association's meeting last year a great number of questions were asked in regard to Honolulu Dairymen's Association's establishment on Sheridan street. While no inquiries have been made this time, I nevertheless shall use this opportunity to state that the interest then taken in that concern by the medical profession undoubtedly was conducive to the far-reaching improvements which have been effected during the past year. The steam sterilization of bottles and containers has been perfected, the milk room proper has been made absolutely fly-proof and the walls made as smooth as enamel. An ice cream factory has been

established, and its products are guaranteed always to be up to the official requirements as to milk fat, natural flavors and absence of chemicals and preservatives. All the milk is carefully strained, electrically treated by a process which practically pasteurizes it without leaving any taste, usually noticeable in ordinary pasteurized milk. As this Association handles nearly 75 per cent. of the milk consumed in Honolulu, and as the process carries with it the cooling of the milk to nearly 40° F., its beneficial effect is obvious, especially as the official requirements are complied with so long as the milk producer cools his milk to 77° F., which is practically no cooling at all as this temperature hardly inhibits the development of micro-organisms in any perceptible degree. Cold storage rooms, ice machine and artesian well are some of the other improvements of the Association's worth mentioning, and scrupulous cleanliness is enforced throughout every step in the preparation of the milk and its products for local market. So long as these conditions prevail I can recommend the Association's products to the practicing physicians of Honolulu, and would suggest that a visit to the premises would, perhaps more than anything I can tell you, convince you of the truth of my statements.

DIVISION OF ENTOMOLOGY.

Honolulu, November 15, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of October, 1915, as follows:

During the month 44 vessels arrived at the port of Honolulu, of which 15 carried vegetable matter. Of these vessels, 7 passed through the Panama canal.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1210	21,393
Fumigated	3	6
Burned	19	20
Returned	4	8
Total inspected	1236	21,427

Of these shipments 21,160 packages arrived as freight, 148 packages as mail matter and 119 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 25,853 bags of rice and 6175 bags of beans arrived from Japan, all of which was found free from pests and was allowed to enter the Territory.

Pests Intercepted.

Eighteen packages of fruit were taken from passengers and immigrants coming from foreign countries and were destroyed by burning.

Six ornamental plants arrived by the transport Dix from Japan and as the consignee had no permit from the Federal Horticultural Board for this shipment they were refused entry.

Four cases of rose plants from California had to be fumigated on account of being infested with rose aphis. A cactus plant from Japan was fumigated and the soil removed from its roots as a precautionary measure.

One package of tree seed and one package of bulbs arriving by mail from Japan were returned to shipper as being unmailable under ruling of the Federal Horticultural Board.

All shipments of fruit and vegetables coming from the Coast were in very excellent condition in regard to quality and all shipments were free from infestation. While on a visit to California I called on the various shipping firms who have consignees here and impressed upon them the necessity of shipping the very best products for our consumption. I also explained to them that owing to the six-day trip, particular care should be exercised in selecting the best shipping varieties as all soft fruits invariably showed ill effects from a long journey.

Beneficial Insects.

During the month of October the following parasites of fruit-flies have been bred:

Tetrastichus giffardii	20,600
Diachasma fullawayi	961
Diachasma tryoni	714
Total bred	22,275

Including the usual quota of parasites of the horn, house and stable fly bred during the month, the following parasites were liberated in various sections:

Tetrastichus giffardii	18,400
Diachasma fullawayi	916
Diachasma tryoni	679
African spalangia	1,600
Philippine spalangia	1,500
African Hornfly	1,400
Philippine Pteromalid	1,200
Total distributed	25,695

As usual, large quanties of *Opius humilis* were liberated from the insectary bred from fruits collected in various sections. We have been able to recover from fruits collected in the field small quantities of *Diachasma fullawayi* and *Tetrastichus giffardii*. We are now placing fruits from many localities where the various parasites have been liberated for the purpose of getting the percentage of parasitism existing in such places.

About 200 parasites (*Leptomastix histrio?*) of the Mealybug were liberated during the month. This species has been successfully bred from the Sugarcane Mealybug (*Pseudococcus sacchari*) by Mr. O. H. Swezey in his laboratory.

Hilo Inspection.

During the month of October, Brother Matthias Newell reports the arrival of 8 steamers, of which 6 brought vegetable matter consisting of 387 lots and 6580 packages. The T. K. K. steamer Anyo Maru arrived on October 8th, direct from Japan, bringing 8248 bags of rice and 385 bags of beans, 100 bags of corn and 20 bags of peanuts. All of these shipments were found free from pests and allowed to enter the port.

Inter-Island Inspection.

During the month 51 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	396	bags
Plants	78	packages
Vegetables	38	"
Fruit	6	"
Total bags and packages inspected	518	

The following packages were refused shipment on account of infection and also of having undesirable soil attached to the plants:

Plants	12	packages
Fruit	10	"
Total refused shipment	22	"

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, November 17, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of October, 1915:

Forest Fires.

On October 6 there was a fire on the ridge between Wailupe and Niu Valleys, Oahu, which burned over a few acres of land covered with grass and lantana. A severe wind was blowing at the time, but the fire was promptly extinguished that same night by ten men whom Judge A. Perry personally conducted to the area.

Kahoolawe.

In company with Commissioner H. M. von Holt I visited the Kahoolawe Forest Reserve from October 8-11. Mr. Eben Low kindly took us over to the island in his launch and furnished us with riding horses and other accommodations while on the island. We found the island greatly benefited by the recent heavy rains, which have made the pili grass and native weeds, such as ilima and ahuloa, grow tall and rank, and by the reduction of stock which has enabled the algaroba trees and herbage to get a good start. We found these young trees in almost every situation on the island where the pili grass grows, and if they are not injured in any way they promise to become quite a forest. A part of the top of the island is still nothing but bare red dirt, but if all stock is removed from the island it is my belief that the grasses at least will encroach on the barren land. Several dozen highland ironwood trees, *Casuarina cuadrivalvis*, which Mr. Low planted on the upper part of the island at an elevation of 1200 feet in April, 1912, are well established and growing nicely, and in the same region the forage grass, *Paspalum dilitatum,* which he set out, is spreading rapidly over a large area and promises to be a good soil-binder. It is estimated that there still remain

on the island approximately three hundred wild goats and seventy-five semi-wild sheep. Definite plans for the removal of these are now being formulated.

Waianae Trip.

On October 21 I visited a portion of the Waianae-kai Forest Reserve and made a thorough investigation of the occupancy of a piece of land in this reserve by an Hawaiian, Thomas Makia. A special report on this has already been submitted to you. I also got a line on a local resident who could serve as a Forest Ranger for this district to keep up the forest fences and do other patrol work on the reserves in this locality. It is planned to have the new ranger begin work here on December 1.

Forest Fencing.

Forest Ranger Kaina D. Lovell reports that at the end of October, 3,500 feet of the fence along the forest reserve boundary at Anahola, Kauai, had been completed.

The only bid received in response to the advertisement for the construction of the fence around Section B of the Olaa Forest Park Reserve on the Volcano Road, Hawaii, was received from Mr. A. J. W. MacKenzie and amounted to $260.27. The job was, therefore, awarded to him. It is expected that this fence will be completed before the end of November.

Sale of Awa Root.

Mr. C. M. Hudson of Hilo, Hawaii, submitted the only bid for purchasing an unestimated amount of awa root in the Hamakua Pali Forest Reserve, Hawaii, and it was at the rate of three cents per pound, dry weight. The sale was, therefore, awarded to Mr. Hudson, and the agreement, which was approved on October 26, runs for one year from that date and requires the same conditions as to the planting of awa slips and the prevention of damage to forest growth as those required in the agreement with Mr. Hudson for gathering two tons of awa root in the Puna Forest Reserve, mentioned in my routine report for September.

Cattle in Nuuanu Valley.

On October 28 I was informed that there were eight head of cattle in the upper part of Nuuanu Valley on the Honolulu Watershed Forest Reserve, which had come over from Kaneohe. I at once took up the matter with Manager O. C. Ludloff of the Kaneohe Ranch Company and he informed me that these eight head had been removed from the forest reserve on October 24.

Forest Reserve Notices.

Five hundred copies of the following notice have been printed on cloth and I have begun to have them posted in conspicuous places at the boundaries and within the forest reserves on all islands:

FOREST RESERVE
BOARD OF AGRICULTURE AND FORESTRY
TERRITORY OF HAWAII

All persons are warned not to start fires or to commit any depredations on this land, under penalty of the law. The removal of any material from the Forest Reserve without a permit is prohibited.

C. S. JUDD,
Superintendent of Forestry.

It is hoped that these signs will have a beneficial effect in acquainting the public with the location of the different reserves and in mitigating the few depredations in the forests which have been occasionally reported.

Seed Distribution.

A consignment of seeds of some of our successfully introduced timber and ornamental trees has been sent to the Director of Forestry at Manila, P. I., in order to assist the Bureau of Forestry there in tree introductions.

A small consignment of seed of the karaka tree, *Corynocerans laevigata,* was received during the month through the kindness of Mr. Eric Knudsen. This tree was introduced from New Zealand by his father and planted at Halemanu, Kauai, where it has spread considerably. While not a very valuable timber tree, the karaka is believed to be a good watershed cover, and suitable for many of the wet localities at the higher elevations on these islands. It has already done well on Molokai. Young seedlings of this tree are being raised at the Government Nursery for planting at the higher elevations on this island, and seeds were distributed to Mr. W. F. Pogue and Mr. L. von Tempsky for planting on the higher elevations of Maui.

Mr. George Munro of Lanai has kindly agreed to secure for this Division, from his brother in New Zealand, seeds of many trees growing there which might do well in these Islands.

Arbor Day.

The Governor of the Territory has officially declared Friday, November 19, as Arbor Day, and already many thousands of trees have been distributed to school children and homesteaders on the other islands for planting on this day. The men at the nursery

have also been very busy in preparing for the distribution of trees for planting in and around Honolulu on Arbor Day.

Basket Willow.

A handsome wicker settee has been made by one of the Portuguese laborers of the Board from the yellow willows, *Salix vitellina,* grown at the Makiki Experiment Garden from slips introduced by Dr. L. R. Gaspar from Funchal, Madeira, in 1909. This settee has been placed on exhibition in one of the windows of the Coyne Furniture Company for a few days in order to indicate to the public the possibilities of osier culture and of a wicker furniture industry here in these islands.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

FOREST NURSERYMAN'S REPORT.

Honolulu, November 22, 1915.

Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the work done during the month of October, 1915:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold		250	39	289
Gratis		150	654	804
		400	693	1093

Collections.

Collections on account of plants sold amounted to $3.50.

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 2900 in transplant boxes ready to set out.

Collection and Distribution of Seed.

Our seed collectors have been kept busy in and around the city collecting seed of flowering and forest trees. We have received from H. W. Potts, principal of the Hawkesbury Agricultural College, Richmond, New South Wales, a package of seed of choice eucalyptus and other trees. We have been requested to send sample packages of our seed in return. A package will be mailed to Mr. Potts by the first steamer going south.

Makiki Station.

Work in connection with Arbor Day and other routine work has kept the men busy during the month.

Honolulu Watershed Planting.

Owing to the rank growth of grass and other weeds which have sprung up around the recently planted trees we had to abandon the planting for a time and put the men to hoeing and clearing off. A large part of the first planted area is now safe and will not require any more attention as the trees are well above the grass and brush and are able to take care of themselves.

Advice and Assistance.

The writer has been called upon to make visits and otherwise give advice and assistance as follows: Calls made in and around city, 12; requests for advice answered by telephone, 15; requests for advice answered by letter, 4; requests for advice by people calling at the nursery, 7; total, 38.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, November 12, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during October, 1915, is submitted:

Weather Conditions.

Rainfall was plentiful on all islands during the month, increasing in quantity towards the end of the month. All streams, ditches and reservoirs were well supplied at the end of the month.

Special Investigations.

Kipapa Ditch Losses, Oahu—On October 23, the manager of the Oahu Sugar Co., Ltd., asked if this office could make a few measurements on the Kipapa flood water ditch of that plantation, to determine seepage losses. This investigation was undertaken on October 26, and it was found necessary to extend the work over to include the 27th, in order that reliable data might be obtained. The data obtained were very valuable and resulted in the resolution, by the directors of this plantation, to expend about $40,000.00 in lining this ditch with cement or concrete. A copy of the report, with blue prints, furnished the Oahu Sugar Co., Ltd., is appended hereto.

Dry Weather Flow Between Waialae and Makapuu Point, Oahu—An investigation was made to determine the advisability of establishing weir stations in the upper valleys between Waialae and Makapuu Point, to measure the duration and quantities of flowing water in these valleys in dry weather. Inquiry of land holders and inhabitants of these valleys leads to the conclusion that there is no surface flow, except for periods of a few weeks after heavy rains, and that the expenditure of time and funds necessary for an intensive investigation of this kind is not justified. The investigation of the flow of springs near sea level in these valleys will be undertaken, as soon as weather conditions permit.

East Maui Ditch Flow—At the request of His Excellency the Governor and the Land Commissioner of Hawaii, an investigation to determine the quantities of water diverted from the areas under each of the five Territorial water and land leases on East Maui was started. In order that ditch improvement work costing about $300,000.00 may be started in the near future, an attempt is being made by the lessees of Leases Nos. 475B and 658—which terminate in 1916 and 1919 respectively—to have these leases renewed as soon as possible. The flow of streams and ditches in this region has been under investigation by this division and the U. S. Geological Survey since 1910. The East Maui Irrigation Company has furnished all data in its possession and from all data at hand an estimate of the mean flow, in million-gallons per day, diverted from the lands under each lease has been worked out. This report was completed on November 10, and copies thereof will be submitted with the regular November report.

Special Work For the Governor.

This division began the preparation of colored maps showing the Territorial lands, homesteads, Federal reservations, Territorial and private forest reserves as well as tunnels, ditches, etc., of the islands of Kauai and Maui. Tables of ditch and stream flow from Territorial lands are also being prepared. These data

and maps are to be used by the Governor as exhibits at Washington, D. C., in the near future. The work will be completed in November.

Honolulu Water Commission.

This commission has obtained and copied during the month numerous data filed in this office.

New Construction.

Kauai—Two of the three new stream measurement stations being established on the three main branches of the Waimea river, above all diversions, were completed and work on the third station was about two-thirds completed. A serious accident occurred on October 28, at this last station site, when a steel eyebolt made of one-inch diameter steel parted, and dropped D. E. Horner, field assistant, and Shima Taniguchi, laborer, onto the stream bed bowlders 18 feet below. Both men were badly bruised and shaken up, but no bones were broken. Both were taken to Waimea and both are convalescing. In compliance with the Workmen's Compensation Act, the proper papers have been completed and forwarded to the proper authorities.

Oahu—Three new reinforced concrete "controls" or broad crested weirs were completed on the Koloa, Wailele, and Kahawainui streams near Laie. These stations are maintained in coöperation with the Laie Plantation Co. to determine the flood discharge of these streams, in connection with a proposed flood water storage project in the vicinity.

1913-1915 Biennial Report.

The office and computation work progressed favorably and this report is considered as 98 per cent. complete. Blue print data for all islands will probably be available for distribution by December 31, 1915.

Leave of Absence.

G. K. Larrison, superintendent, was absent on leave October 15 to 19 as a National Guard officer in connection with the annual U. S. Army maneuvers on Oahu.

H. A. R. Austin, junior engineer, U. S. Geological Survey, was absent on leave October 7 to 31, attending the annual conference of engineers of the U. S. Geological Survey held at San Francisco, October 15 to 25.

Routine Maintenance and Operation Work.

Kauai—W. V. Hardy, assistant engineer, and D. E. Horner, field assistant, visited 15 stream and ditch and 16 rain measure-

ment stations. Ten stream and ditch measurements were made and about five miles of foot trails cleared of vegetation.

Oahu—Fifteen stream and ditch and two rainfall measurement stations were visited. Eight measurements were made at regular stations and 20 miscellaneous ditch measurements were made.

Maui—Nothing was done on Maui except to keep clock driven water registers in operation. G. K. Larrison, superintendent, visited Paia, Maui, on October 29-31, and collected ditch runoff data of the East Maui Irrigation Company.

Hawaii and Molokai—Only rainfall observations were made by coöperative observers.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

AN ANNOTATED REFERENCE LIST OF THE MORE COMMON TREES AND SHRUBS OF THE KONAHUANUI REGION.

By Vaughan MacCaughey, *College of Hawaii.*

The following list was originally made for use in the author's courses in dendrology and in general botany, in the College of Hawaii. It includes all of the commoner species of native trees and shrubs found in the forested mountains back of Honolulu. These mountains, of which Konahuanui is largest and highest, are frequently visited for botanical collecting and study, as well as for their scenic beauty. The forest of the mountain range proper is hydrophytic, "rain forest." The list includes the rain forest and the humid lower forest; it does not include the dry foothills and other xerophytic districts. Professor John S. Donaghho of the College of Hawaii has prepared a large map of the mountains back of Honolulu, showing contour intervals and trails.

The arrangement is alphabetical, with cross-references, giving botanic, Hawaiian and English names. The localities given under each species are typical or representative regions; the great majority of the species are abundant all along the Koolau mountain range, from Niu and Wailupe west to the forests mauka of Kahuku. The list has proved of distinct use for reference purposes, and may be of interest to readers of the Forester.

Aalii—See Dodonea.

Acacia Koa Gray—*Koa;* abundant in the lower and middle portions of the Koolau forests; occurring plentifully along ridges of Tantalus, Kalihi, Hillebrand's Glen, Pohakea, Palolo. (Legume family.)

Ae—See Zanthoxylum.

Aha-kea—See Bobea.

Aiea—See Nothocestrum.
Akia—See Wikstroemia.
Alaa—See Sideroxylon.
Ala-hee—See Plectronia.
Alani—See Pelea.

Aleurites moluccana (L.) Willd.—*Kukui*; well-known tree; the most conspicuous member of the Koolau lower forest. Abundant at the heads of all the valleys back of Honolulu, up to an elevation of about 2200 feet. (Euphorbia family.)

Antidesma platyphyllum Mann—*Hame* or *Haa;* a medium-sized tree; fairly common in the rain forest, 1500-3000 feet; Kalihi, Kahauiki, Hillebrand's Glen, Konahuanui. (Euphorbia family.)

Bobea elatior Gaud.—*Ahakea*; medium tree; fairly abundant in all parts of the Koolau rain forest; Manoa, Pauoa, Hillebrand's Glen, Kahauiki, etc. (Madder family.)

Broussaisia arguta Gaud.—*Kanawau* and *Puahanui*; very common shrub, occasionally arborescent; occurs throughout the rain forest, 1000-3000 feet; abundant around Olympus, Konahuanui, Lanihuli. (Saxifrage family.)

Charpentiera obovata Gaud.—*Papala;* medium-sized tree; plentiful throughout the Koolau range; abundant in shady protected ravines and pockets, above Woodlawn, and back of Tantalus. (Amaranth family.)

Cheirodendron Gaudichaudii (DC.) Seem—*Olapa*; common in the rain forest above 2000 feet, usually in groups; Hillebrand's Glen; Pauoa, Palolo, Olympus, etc. (Aralia family.)

Cheirodendron platyphyllum (Hook. & Arn.) Seem—*Lapa-lapa*; occurs only on the summit peaks and ridges of the Koolaus: Konahuanui, Lanihuli; not found below 2500 feet. (Aralia family.)

Cibotium Chamissoi Kaulf—*Hapu*; the small tree fern; fairly common above 1200 feet. (Tree Fern family.)

Clermontia oblongifolia Gaud—*Ohawai*; shrub or small tree, fairly common in the rain forest: Tantalus, Manoa, Pauoa, etc.

Clermontia persicaefolia Gaud—*Ohawai*; shrub or small tree, fairly common in the rain forest: Hillebrand's Glen, upper Kalihi, upper Palolo, etc. (Campanula family.)

Coprosma longifolia Gray—*Pilo;* small tree, common along the upper ridges throughout the Koolau rain forest: Konahuanui, Lanihuli, etc. (Madder family.)

Dodonaea viscosa L.—*Aalii*; small tree, occurring gregariously throughout the Koolau range, from the lower forest to the summit ridge: Waialae, Palolo, Manoa, Kahauiki, etc. (Soapberry family.)

Dubautia plantaginea Gaud—*Naenae*; shrub or small tree, common in the Koolau forests above 1800 feet: Konahuanui, etc. (Composite family.)

Ebony, Hawaiian—See Maba.

Elaeocarpus bifidus Hook & Arn.—*Kalia;* small or medium tree (30-40 ft.), fairly common along the upper ridges, and in hanging valleys, throughout the Koolau range: Lanihuli, Konahuanui, etc. (Eleaocarpus family.)

Eurya Sandwicensis Gray—*Wanini*; shrub or small tree, occurring fairly commonly in the rain forest up to the summit ridges: Konahuanui, Olympus, etc. (Tea family.)

Gardenia Remyi Mann—*Manu;* small tree, occurring here and there in the rain forest throughout the Koolaus: Tantalus, Pauoa, Palolo, Lulumahu Pohakea. (Madder family.)

Gouldia axillaris Wawra—*Manono*; small tree, throughout the Koolau range in the rain forest, most abundant near the summit ridges: Konahuanui, Olympus, etc. (Madder family.)

Haa—See Antidesma.

Hame—See Antidesma.

Hao—See Rauwolfia.

Hapu—See Cibotium.

He-ae—See Zanthoxylum.

Hesperomannia arborescens Gray—Shrub or small tree; occurs here and there along summit ridges and peaks of the Koolaus. (Composite family.)

Hibiscus Arnottianus Gray—*Kokia Keokeo;* native white hibiscus; a tall shrub or small tree; on slopes and along stream beds throughout the Koolau rain forest: Tantalus, upper Manoa, Hillebrand's Glen, Lulu-mahu, etc. (Cotton family.)

Ho-awa—See Pittosporum.

Hydrangea, Hawaiian—See Broussaisia.

Ilex Sandwicensis (Endl.) Loes—*Kawau*; small to medium tree; very common throughout the rain forest; abundant on the upper ridges and slopes of Konahuanui, Olympus, Tantalus, etc. (Aquifolia family.)

Ili-ahi—See Santalum.

Ironwood, Hawaiian—See Rauwolfia.

Jambosa malaccensis (L.) P.EC.—*Ohia ai;* Mountain Apple; well-known tree; gregarious in valleys and gulches along mountain streams: Moanalua, Pauoa, Hillebrand's Glen, Palapu, Ohuohi. (Myrtle family.)

Kalia—See Elaeocarpus.

Ka-maka-hala—See Labordia.

Kana-wau—See Broussaisia.

Ka-wau—See Ilex.

Koa—See Acacia Koa.

Kokia Keo-keo—See Hibiscus.

Kolea—See Suttonia lessertiana.

Kolea lau-lii—See Suttonia Sandwicensis.

Ko-piko—See Straussia.

Ko-piko Kea—See Straussia Kaduana.

Ku-kui—See Aleurites.

Labordia membranacea Mann—*Kamakahala;* small tree, fairly common in the rain forest: Olympus, upper Manoa, Konahuanui, Lulu-mahu, Lanihuli, etc. (Logania family.)

Labordia seesilio Gray; medium tree; confined to the Koolau rain forest, particularly along the summit ridges: Olympus, Manoa trail, Konahuanui, Lanihuli, etc.

Lama—See Maba.

Lehua ahihi—See Metrosideros tremuloides.

Lehua papa—See Metrosideros.

Loulu hiwa—See Pritchardia.

Maba Sandwicensis A.DC.—*Lama;* medium tree; occurs plentifully throughout the Koolau rain forest: upper Manoa, upper Nuuanu, upper Kalihi, etc. (Ebony family.)

Ma-maki—See Pipturus.

Ma-no-no—See Gouldia.

Maua—See Xylosma.

Metrosideros macropus Hook & Arn.—*Ohia lehua*; a large tree, occurring here and there in the rain forest, but uncommon as compared with *polymorpha,* Lulu-mahu, Kalihi, Moanalua.

Metrosideros polymorpha Gaud.—*Ohia lehua*; shrubby or medium tree, very common on ridges and valley slopes throughout the Koolau range: Tantalus, upper Manoa, Olympus, etc. (Myrtle family.)

Metrosideros rugosa Gray—*Lehua papa;* small tree or shrub, growing on exposed ridge combs, windward cliffs and pockets, along the Koolau range.

Metrosideros tremuloides (Heller) Rock—*Lehua ahihi;* small tree on ridges and slopes throughout the Konahuanui region —Tantalus, Lanihuli, etc.—at 1000-2000 feet elevation.

Mountain Apple—See Jambosa.

Myoporum Sandwicense (DC.) Gray—*Naio;* common forest tree, in sheltered places on slopes and in valley heads: Kalihi, upper Nuuanu, Pauoa, Tantalus, Manoa, etc. (Myoporum family.)

Naio—See Myoporum.

Nae-nae—See Dubautia.

Nanu—See Gardenia.

Nau-paka—See Scaevola.

Nothocestrum longifolium Gray—*Aiea*; shrub or small tree; fairly common in the Koolau rain forest: Tantalus, Olympus, Hillebrand's Glen, etc. (Potato family.)

Oha-wai—See Clermontia.

Ohe mauka—See Tetraplasandra.

Ohe-ohe—See Petrotropia.

Ohia ai—See Jambosa.

Ohia lehua—See Metrosideros polymorpha.

Olapa—See Cheirodendron Gaudichaudii.

Olive, Hawaiian—See Osmanthus.

Olo-mea—See Perrottetia.

Olopua—See Osmanthus.

Opuhe—See Urera.

Osmanthus Sandwicensis (Gray) Knobl.—*Olopua* or *Pua;* Hawaiian Olive; occurs here and there in the lower forest zone; Tantalus, Palolo, Waialae, Kalihi. (Olive family.)

Palm, native fan—See Pritchardia. The botanic status of the various native fan palms (*loulu*) is still unsettled.

Pa-pala—See Charpentiera.

Pa-pala Ke-pau—See Pisonia.

Pelea clusiaefolia Gray—*Alani;* small to medium tree, common throughout the Koolau Range at 1800-2400 feet; plentiful in upper Palolo, Lulumahu, Hillebrand's glen (Rue family).

Pelea rotundifolia Gray; shrub or small tree, fairly abundant here and there throughout the Koolau rain forest; occurs on Tantalus, Olympus, Konahuanui, etc. (Rue family.)

Pelea Wawreana Rock; small tree; fairly common along the Koolau ridges at 1800 to 2500 feet; Tantalus, Manoa, Konahuanui, Lanihuli, etc. (Rue family.)

Perrottetia Sandwicensis Gray—*Olomea;* tall shrub or small tree; common in the forests above an elevation of 1000 feet; Kahau-iki, Lulu-mahu, Tantalus, Manoa, Ka-au, etc. (Celastrus family.)

Pilo—See Coprosma.

Pilo Kea—See Platydesma.

Pipturus albidus A. Gray—*Mamaki.* Tall straggling shrub, abundant above 1000 feet, on valley slopes and protected places. Abundant in the lower forest at the head of Manoa Valley. (Nettle family.)

Pisonia umbellifera (Forst.) Seem; *Papala Kepau;* a small tree, abundant in the lower forest zone, on slopes and ridges. Gregarious in such places as Tantalus, Lulu-mahu, Ohu-ohi, and Hillebrand's Glen. (Four O'clock family.)

Pittosporum glabrum Hook. & Arn.—*Hoawa;* small tree, quite common on Konahuanui, Lanihuli, Olympus, and at the heads of Pauoa, Manoa, Palolo, Waialae, etc., at an elevation of 1800-2200 feet. (Pittosporum family.)

Pittosporum Spathulatum Mann—*Hoawa;* shrub or small tree; abundant in the upper rain forests of the Koolau range; plentiful on Lanihuli, Konahuanui, Olympus. (Pittosporum family.)

Platydesma campanulatum Mann.—*Pilo Kea;* shrub or small tree; abundant throughout the Koolau rain forest; Konahuanui, Olympus, Lanihuli, Lulu-mahu, Hillebrand's Glen, etc. (Rue family.)

Plectronia odorata (Forst.) F. v. M.—*Ala-hee;* shrub or small tree, common and gregarious in many parts of the lower forest zone, up to 1800 feet; Waialae, Manoa, Nuuanu, Kalihi, Kalaniki. (Madder family.)

Pritchardia Martii H. Wendl.—*Loulu hiwa;* a native fan palm; occurs solitary and in clumps on windward palis, near the main ridge, and at the heads of valleys. (Palm family.)

Psychotria hexandra Mann—small tree, occurring scatteringly throughout the Koolau rain forest; Olympus, upper Manoa, Konahuanui, Lanihuli, etc. (Madder family.)

Pterotropia gymnocarpa Hbd.—*Ohe-ohe;* small to medium tree; throughout the rain forest along the main ridge; Konahuanui, Lanihuli, Olympus, etc. (Aralie family.)

Pua—See Osmanthus.

Pua-ha-nui—See Broussaisia.

Pu-Keawe—See Stylphelia.

Rauwolfia Sandwicensis A. DC.—*Hao;* medium shrub or small tree; in drier parts of the forest at 1800-2200 feet. Kalihi, Ka-hau-iki, Tantalus, Waialae. (Dogbane family.)

Sandalwood—See Santalum.

Sandalwood—Bastard—See Myoporum.

Santalum ellipticum Gaud.—*Iliahi*—Elliptic-leaved Sandalwood; a small tree; plentiful in the lower forest zone of Waialae, Palolo, Pauoa, and Hillebrand's Glen. (Sandalwood family.)

Scaevola Chamissoniana Gaud.—*Naupaka;* large shrub or small tree, abundant in the lower and middle forests throughout the Koolau Range. (Goodenia family.)

Sideroxylon Sandwicense (Gray) Benth. & Hook.—*Alaa;* small to large tree; Hillebrand's Glen, Lulu-mahu, upper Pauoa, upper Manoa, Palolo, etc. (Sapota family.)

Straussia Fauriei Levl.—*Kopiko;* shrub, occurring here and there on exposed ridges and summit peaks; Konahuanui, Lanihuli, etc.

Straussia Kaduana (Cham. & Schlecht) Gray.—*Kopiko Kea;* small tree; common in the rain forest; Pauoa, Lulimahu and Hillebrand's Glen, etc. (Madder family.)

Styphelia tamieamiea F. Muell.—*Pukeawe;* a small or medium shrub, growing on exposed ridges, common; gregarious; Olympus trail, Woodlawn ridges, Tantalus, Lanihuli, etc. (Epacris family.)

Suttonia lessertiana (A. DC.) Mez.—*Kolea;* medium shrub to large tree; common in the rain forest above 2000 feet; Waialae, Palolo, Tantalus region, Kalihi, Kahauiki, etc. (Myrsine family.)

Suttonia Sandwicensis (A. DC.) Mez.—*Kolea lau-lii;* shrub, plentiful throughout the rain forest, above 2500 feet; Lanihuli, Konahuanui, Olympus, etc.

Tetraplasandra meindra (Hillebr.) Harms; small to medium tree; in hanging valleys and on upper slopes of main ridge; Lulu-mahu, Konahuanui, Palolo, etc.

Tetraplasandra Oahuensis (Gray) Harms—*Ohe mauka;* a small tree, not abundant, solitary; occurs in Pauoa, Nuuanu, Kalihi, and on Lanihuli and Konahuanui. (Aralia family.)

Tree fern—See Cibotium.

Tree-thistle, Hawaiian—See Hesperomannia.

Urera Sandwicensis Wedd.—*Opuhe;* tall shrub or small tree; fairly common; growing on valley slopes. Frequent in Hillebrand's Glen. (Nettle family.)

Wala-hee—See Plestronia.

Wa-nini—See Eurya.

Wikstroemia Oahuensis (Gray) Rock—*Akia;* small shrub or small tree, occurring from the lower edge of the forest up to the summit peaks; Waialae, Palolo, Konahuanui, Kahau-iki, etc. (Mezereum family.)

Xylosma Hawaiiense Seem.—*Maua;* shrub to small tree; fairly common in the rain forest, at 1800-2200 feet elevation; upper Nuuanu, Pauoa, Manoa, etc. (Flacourtia family.)

Zanthoxylum Oahuense Hbd.—*Ae* or *He-ae;* a small tree, occurring here and there alone or in small clumps along the upper ridges of the Koolaus. There are several clumps on the summit of Konahuanui, also on Lanihuli. (Rue family.)

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G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN

FORESTER & AGRICULTURIST

VOL. XIII. FEBRUARY, 1916. No. 2

EDITORIAL COMMENTS.

Action on the resolution introduced at the annual meeting of the Hawaiian Sugar Planters' Association in December by Hon. L. A. Thurston, chairman of the committee on forestry, should furnish tree planters in the Territory with much valuable data on the proper kinds of trees to plant for water conservation, for the prevention of sand and dust drifting, and for the production of firewood, timber, posts, ties, poles, etc. The information concerning the different values of a great number of trees, contributed by Messrs. David Forbes, L. von Tempsky and C. S. Judd, and printed in the annual report of this committee for 1915, is a good beginning in this study which will further the cause of economic forestry in Hawaii.

The seven-acre experimental eucalyptus plantation, started in Nuuanu valley in 1911 in coöperation with the U. S. forest service, is growing nicely and already promises to show up the comparative values of the eighteen new species of eucalyptus for planting in these islands. In order to make the experiment permanent, the boundaries of each plot of trees, which range from one-third to one-half acre in size, have recently been marked by the Territorial forester with iron pipes and brass tags.

The wonderful success obtained by the newly-adopted cure for sorehead or chicken pox, administered by the Territorial veterinarian to the infected flock of imported black minorca chickens belonging to Mr. H. F. Fisher at Olaa, Hawaii, and to the flock of young sick turkeys of Miss Ladd in Honolulu, should be a great encouragement to poultry raisers whose flocks have suffered from this disease in the past.

Bulbs from Holland, orchids from New Jersey and Australia, wax palms from Singapore, chrysanthemums and peach blossoms from Japan, and ginseng roots from Korea were among the interesting importations which Chief Plant Inspector Ehrhorn examined for injurious insects during November.

The stock-proof fence around the koa grove at 29 Miles on the Volcano road, Hawaii, which was completed in December,

will insure the preservation of this interesting territorial forest reserve. One of the largest koa trees in the islands, within this reserve, is among the incidental points of interest viewed by visitors to the volcano of Kilauea.

The 31 inches of rain which fell in upper Nuuanu during November was the heaviest monthly rainfall recorded since the rain gauge was established in 1911, and assures Honolulu of a sufficient water supply for some months to come.

The reappearance of hog cholera on Oahu in November confirms the wisdom of the Board in passing, several years ago, Rule VII of the Division of Animal Industry which forbids the shipment of hogs from Oahu piggeries to any of the other islands.

The idea that there is a considerable amount of accessible awa root growing in the forest reserves is rapidly being dispelled. The holder of permits for gathering awa root in the Puna and Hamakua Pali forest reserves on Hawaii is having a hard time in locating much, if any, of this commodity.

Each of the 1350 school children who called at the government nursery on Arbor Day and took away a tree for planting, should have been impressed with the lesson of the value of trees at least for ornamental purposes.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, December 30, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit as follows my report for the Division of Animal Industry for the month of November, 1915:

Hog Cholera.

This disease has again made its appearance in Honolulu and vicinity, beginning in Kalihi in a small piggery, where the disease has never been known before. From there it spread to Wahiawa, by the transfer of infected pigs, and a number of animals were lost. By the prompt application of serum the Wahiawa outbreak was checked, but, without any traceable means of transmission, the disease appeared in a large piggery in Kuliouou and in a smaller one at Puuloa. As the available serum supply became exhausted a number of hogs were lost at Puuloa, even though most of the animals had previously been serum treated. The same applies to the Kuliouou outbreak, where serum fortunately was on hand and serious losses were prevented by prompt appli-

cation. There, for the first time, the double or serum-virus treatment was tried, one of the sickest pigs being bled by cutting off the tail, and the blood injected simultaneously with the serum. Every precaution was taken to prevent the further spread of the disease, and it may be said that at the present writing the outbreak is under complete control. A large supply of serum was cabled for and arrived in record time, and the total losses of hogs were undoubtedly limited to less than ten per cent of what they would have been if the serum treatment had not been known.

The source of infection remains unknown. No hogs were imported from abroad and no herds were known to be infected at the time. The outbreak must, therefore, be ascribed to either a recrudescence of dormant virus on the respective premises where the disease appeared, or to so-called "carriers."

The simultaneous appearance of *chicken cholera,* a disease of poultry almost identical with hog cholera and by some authors considered even transmissible from hogs to poultry and vice versa, speaks for the recrudescence theory. This disease, chicken cholera, appeared among a shipment of muscovy ducks from Mokapu and consigned to the territorial marketing division. Prompt treatment with intestinal disinfectants—sulphate of iron —and thorough disinfection in connection with the segregation of the infected and exposed birds, seems to have effectively checked the outbreak by this time.

Sore-head or Chicken Pox.

The statement in my September report to the effect that sore-head in poultry could be successfully treated by means of a vaccine made from the crusts or cores removed from the heads of affected birds appeared to have been welcome to a number of chicken raisers. Mr. H. F. Fisher of Olaa, Hawaii, responded immediately by sending a small bottle full of such crusts removed from the combs and wattles of more than 200 imported black minorcas. Sore-head, or chicken pox, had made its appearance among these fine birds with disastrous results, nearly one-third having died at the time the information reached him that the disease could be treated successfully.

When the material forwarded was received, the vaccine was immediately prepared and, with the Board's approval, the writer left the following day for Hilo in order to make personal observations on the effect of the treatment.

As stated nearly one-third of more than 300 head of black minorcas had already died, and very few of the remaining birds were unaffected when the writer arrived with the vaccine.

As a special paper is being prepared on this subject, it is unnecessary here to go into detail about the preparation and application of the vaccine. Suffice it to say that upon the writer's

arrival practically all of the birds were more or less affected, and a dozen or so were in a moribund condition. All the birds were injected and the local lesions treated with tincture of iodine, the injection being repeated on the fifth day. Marked improvement was noticed as early as the second day after the first injection and complete recovery resulted in the course of one to two weeks in practically every case, even four of the dying ones making a complete though slower recovery. There was but slight constitutional reaction to the treatment, some of the birds being temporarily dejected and a few developing diarrhea which was easily checked by means of sulphate of iron in the drinking water.

Without question the treatment in this case proved an unqualified success, some of the recoveries being quite remarkable.

An outbreak of a far more virulent form in a flock of young turkeys is now under treatment in Nuuanu valley in Honolulu. The vaccine treatment was applied without delay and it may safely be said that without it there would not be a turkey left alive today in the infected flock. As it is, only one bird has been lost so far, and nearly all the remaining ones are well on the way to recovery. The bird that died became blind in both eyes, from the tumors invading the eye sockets, and probably starved to death from being unable to find its food. It was very weak at the time of the first treatment, but, though the eyelids were affected, it was not expected that the lesions would so rapidly invade the sockets as to completely destroy the eyesight. Consequently no instructions were left with the caretaker in regard to special care of the bird, and it was lost.

A number of the remaining ones are, however, encouraging illustrations of the most marvellous effectiveness of this modern *similia similibus* treatment which, as stated, consists in the injection, hypodermically, of a solution made from the crusts of the sores that form on the heads of the affected birds. This solution, which would cause a fatal attack of the disease in a healthy bird in a few days after injection, if used in its original strength, is attenuated by heating for one hour to a temperature of 137° F. The heating so reduces the virulence of the infection that its introduction into a healthy bird produces a hardly noticeable attack of the disease, but one which confers permanent immunity against future attacks. At the same time, but for less obvious reasons, it seems to have a strong curative effect on already affected birds.

While but few opportunities have so far presented themselves for experimentation, the fact has been established that birds so badly affected that further treatment seemed useless, have, after the first injection, entered upon a straight road to recovery that is almost unbelievable, and, while sore-head or chicken pox may seem an insignificant disease and of small economic importance, the overwhelming significance of these recoveries, as a promise

of success in the application of this method to other diseases, should not be lost sight of. The importance of this so-called "autogenous" treatment was first brought out two or three years ago when it was heralded as a "cure-all," and naturally soon became discredited. Pneumonia, gonorrhea, pyemia and numerous other specific or non-specific infective diseases were reported cured after but one or two successful experiments with the application of either heated or filtered virus or virulent discharges, but the unreported, unsuccessful cases soon became numerous enough to assert themselves. In veterinary medicine, however, where herds or flocks rather than the individual were experimented with, the method continued and gained in favor, and the sore-head or chicken pox vaccine is the first staple result of these experiments and one which promises new life to the poultry industry. The publicity given to the Hawaii experiment has brought forward the fact that numerous people have quit the raising or even keeping of poultry solely on account of this disease, and that they would willingly take it up again if there was any way of protecting their birds against sore-head. It is, therefore, to be hoped that the experiment now under way will prove successful, as the disease we are now dealing with is of the most virulent type and the birds, young turkeys, are recognized as the most delicate and difficult birds to raise, and if a satisfactory percentage of the flock can be saved and the method of treatment simplified to a point where any intelligent individual can prepare and apply it, a special circular will be prepared, setting forth the essentials of the method, and distributed among present and prospective poultry raisers.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Dec. 17, 1915.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of November, 1915:

Tuberculosis Control.

The following dairy cattle received the tuberculin test:

	Tested	Passed	Condemned
F. S. Lyman	34	34	0
Boys' Industrial School	48	48	0
Aubrey Hotel	1	1	0
Laie Plantation	27	24	3
J. F. Borres	11	10	1
Y. Ozawa	9	9	0
Dr. Straub	27	27	0
J. H. Cummings	1	1	0

A total of 158 head of dairy cattle were tested during the month, out of which number 154 were passed and tagged and 4 condemned and branded. One of the above condemned cows has already been slaughtered.

Post-mortem examination was made at one of the local abattoirs on five cows recently condemned in one of the local dairies. All presented lesions of tuberculosis.

Following your suggestion to ascertain the effect, if any, of a subcutaneous injection of tuberculin on the intradermal method of testing, an experiment was started, the results of which are as follows:

In this experiment nine cows were used. These cows had been condemned in one of the local dairies on October 8, and had been kept segregated ever since. These cows were first given the regular subcutaneous injection of 2 cc. of tuberculin followed by an intradermal injection into the lower eyelid of four drops of special tuberculin.

An examination was made 24 hours after the injection and every animal was showing a distinct reaction to the intradermal test. Forty-eight hours after injection the swelling was still persistent in six, but much reduced in size, and had entirely disappeared in three. Seventy-two hours after injection all local reactions had disappeared. Three of the above animals showed a marked constitutional reaction twenty-four hours after receiving the double injection.

While the above experiment is far too small for formulating any definite conclusions, still the results seem to indicate that a subcutaneous injection of tuberculin does not in any way obscure the local reaction to the intradermal test, but tends to hasten its appearance.

Importations of Live Stock.

S. S. Manoa, San Francisco: 1 Berkshire boar, Cornwell Ranch; 2 Shropshire rams, K. S. Kahului; 23 cts. poultry.

S. S. Hyades, Seattle: 2 Hampshire hogs, 2 Berkshire hogs, Maui Agricultural Co.

S. S. Matsonia, San Francisco: 1 ct. doves, 2 cts. pigeons, 4 cts. chickens, 1 dog, Wells Fargo Express Co.; 32 cts. poultry.

S. S. Lurline, San Francisco: 3 horses, U. P. Transfer Co.; 1 ct. monkey, Wells Fargo Ex. Co.; 1 bull (Durham), W. E. Bellina; 28 cts. poultry.

S. S. Sonoma, San Francisco: 1 dog, E. C. Zitkowski; 1 dog, S. Ozaki; 1 turkey, J. Jurgensen.

S. S. Wilhelmina, San Francisco: 3 dogs, B. F. Rivenburgh; 1 dog, O. B. Shipman; 1 monkey, G. S. Raymond; 36 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, December 10, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of November, 1915, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 18 carried vegetable matter and one vessel moulding sand. Owing to the blockade of the Panama canal only one vessel passed through the same for this port.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1398	37,941
Fumigated	23	39
Burned	56	57
Returned	4	6
Total inspected	1481	38,043

Of these shipments 37,619 packages arrived as freight, 195 packages as mail matter and 229 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 21,993 bags of Japanese rice and 1949 bags of Japanese beans arrived by various steamers, all of which were found free from pests and were passed for entry.

Pests Intercepted.

Thirty-five packages of fruit and 14 packages of vegetables were taken from passengers and immigrants coming from foreign countries and were destroyed by burning.

One lot of ornamental plants arriving on November 1 was found infested with scale (*Phonacaspis eugeniae*) and the lot was fumigated before delivery.

One box of bulbs from Holland was found infested with ants (*Pronolepis longicornis*) and was fumigated with carbon bisulphide before delivery.

One box of orchids from New Jersey, arriving on November 10, was fumigated, as a few plants were found infested with two common orchid scale insects (*Diaspis bois duvalii* and *Aspidiotus Cyanophyllis*).

On November 17 a package of peas from Japan infested with *Bruchus chinensis* was fumigated with carbon bisulphide. Three cases of plants arrived from Singapore on November 29 consisting of two cases wax palms and 1 case *Mussaenda erythrophyllis* which were fumigated and all soil removed from the roots. In the soil were found two species of ants (*prenolepis* and *Monomorium*), the grubs of an *Elaterid* beetle, several cockroaches (*Leucophala surinamensis*) and several millipeds. On the Mussaenda plants was found a mealy bug (*Pseudococcus* species close to *P. citri*). All plants were repotted in sterilized soil so as not to suffer from our treatment. A package of cut flowers consisting of chrysanthemums and peach blossoms brought by a Japanese passenger on November 29 was destroyed.

The chrysanthemums were infested by a fungus forming swellings on the stems. The peach twigs were infested by the white peach scale (*Aulacaspis pentagona*). There was also a cluster of moth eggs on one twig and a small bag worm case attached to another. A small package of chestnuts found in the baggage of an immigrant was burnt on account of being infested with a weevil, probably a *Balanimus* species.

One package of ginseng roots from Korea, two orchids from Australia and a package of eucalyptus seed from China were refused entry into the Territory under rulings of the federal horticultural board.

One box of beneficial insects arrived on November 6 from Mr. F. Muir in my care. This was thoroughly inspected at the Planters' station and all soil and packing were destroyed by burning.

Beneficial Insects.

During the month of November the following parasites of fruit flies have been bred:

Tetrastichus giffardii	16,500
Diachasma fullawayi	925
Diachasma tryoni	639
Total bred	18,064

Including the usual number of parasites of the horn, house and stable fly bred during the month, the following parasites were liberated in various sections:

Tetrastichus giffardii	14,700
Diachasma fullawayi	867
Diachasma tryoni	613
African Spalangia	1,400
Philippine Spalangia	1,200
African Horn Fly	1,400
Galesus silvestrii	250
Philippine Ptoromalid	1,300
Total distributed	21,730

The breeding of the mealy bug parasite (*Paraloptomastix abnormis*) has been continued, but no liberations were made.

Hilo Inspection.

During the month of November Brother Matthias Newell reports the arrival of six steamers, of which five brought vegetable matter consisting of 223 lots and 3904 packages. All these shipments were found free from pests and were allowed to enter the port.

Inter-Island Inspection.

During the month 64 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	503 bags
Plants	282 boxes
Fruit	32 packages
Vegetables	46 packages
Total inspected and passed	863 packages

The following packages were refused shipment on account of infestation and of having undesirable soil attached to the plants:

Plants	14 packages
Fruit	32 packages
Total refused shipment	46 packages

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, December 21, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of November, 1915:

Forest Fencing.

The forest fence along the boundaries of the Kealia and Moloaa forest reserves on Kauai at Anahola and Aliomanu is nearing completion and Forest Ranger Lovell reports that at the end of November 9980 feet of the fence had been constructed.

On November 8 the agreement with Mr. A. J. W. MacKenzie for the construction of the hog-proof fence around Section B of the Olaa Forest Park reserve at 29 Miles on the Volcano road, Hawaii, was executed and, on November 15, the construction of this fence begun.

On November 30 I went over the forest fence on the makai boundary of the Lualualei forest reserve at Waianae and found that it was in need of repair in several places. I am arranging for this work and as soon as the fence is once more cattle-proof I shall have it kept so by Forest Ranger John Pililaau, who began his work in this region on December 1.

Nuuanu Eucalyptus Plantation.

A previous inspection of the experimental plantation of eighteen different new varieties of eucalyptus trees established by my predecessor in Nuuanu valley with federal funds in coöperation with the United States forest service, showed that many of the smaller trees were being choked with the rank Hilo grass. I accordingly employed a laborer for 13 days to clear the grass from around the smaller trees so that now they will have a better chance for growth. The plantation as a whole is doing remarkably well and in a few years valuable data as to these new species of eucalyptus will be available. Since I also found that the corner stakes of hau sticks had not sprouted in most cases, I replaced these with permanent ½-inch galvanized iron pipes, which were placed at appropriate corners and marked with the number of the plot stamped on brass tags.

Forest Reserve Matters.

On November 15 Forest Ranger E. H. Hipple began his work of taking care of the Honolulu Watershed forest reserve lands in Palolo, Manoa and Nuuanu valleys.

Mr. C. M. Hudson of Hilo reported early in the month that

he had as yet been unable to locate any awa root in the Puna forest reserve, Hawaii, being hindered in his search by the heavy rains. As you will recollect, I was authorized to issue him a permit, on September 25, to gather two tons of awa in this reserve during a period of sixty days. Mr. Hudson paid $100 for the awa. Upon the advice of the president of the Board, I extended the time of this permit thirty days.

On November 26 I made a trip to Waimalu valley, Oahu, to locate a small piece of government land called Waholoa in the Ewa forest reserve.

On November 30 I visited the Waianae-kai forest reserve and served notice on Mr. Thos. Makia to move his fence, as instructed by the Board on November 4. On this trip I also instructed Mr. John Pililaau as to his duties as forest ranger for the Waianae district.

Coöperation With H. S. P. A.

During the latter part of the month I completed and forwarded to Mr. L. A. Thurston, chairman of the committee on forestry of the Hawaiian Sugar Planters' Association, a discussion of the native and introduced trees suitable for each of the four following purposes:

1. The conservation of water and protection of watersheds.
2. The protection of lands from destruction by wind and by drifting sand and earth.
3. The production of firewood.
4. The production of timber.

Hilo Sub-Nursery.

In order to provide for more extensive work at the Hilo subnursery, from which a large part of the island of Hawaii is supplied with forest trees, the monthly allowance to Bro. Matthias Newell for the upkeep of this nursery was on November 1 increased from $15.00 to $30.00.

Arbor Day.

Arbor Day was celebrated on November 19, the day proclaimed for this purpose by Governor Pinkham, as shown in the accompanying special report of the forest nurseryman. The celebration of this day was more than usually successful. In all 20,583 trees were given out from the government nursery for planting, and school children to the number of 1350 called at the government nursery and each took away one tree for planting on school grounds. At the request of the Outdoor Circle, I delivered a

short address on trees at the Arbor Day celebration of the Pohukaina school in Kakaako.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, December 15, 1915.

Superintendent of Forestry,
Board of Agriculture and Forestry.

Dear Sir:—The following report gives the principal work done during the month of November:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold		50	162	212
Gratis	2000	300	460	2760
	2000	350	622	2972

Collections.

Collections on account of plants sold amounted to	$ 4.50
Rent of building, nursery grounds, July, Aug., Sept., Oct.	140.00
Total	$144.50

Arbor Day.

The shipping and distribution of trees for Arbor Day planting and other work connected with Arbor Day has taken up most of our time during the month. As will be seen by the special report, handed to you a few days ago, the number of trees distributed for Arbor Day was the largest we have yet had, amounting to 20,583.

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 12,000 in seed boxes and 600 in transplant boxes.

Makiki Station.

Owing to the great demand for trees during the past two months our stock at this station, as well as at the main nursery, is considerably reduced. Our supply of some of the species which we try always to have in stock is entirely exhausted. For the next few months our efforts will be directed toward the building up of our stock again.

Honolulu Watershed Planting.

The work done during the month has been clearing away the grass and weeds from the young trees. This work is now about finished and we intend to commence planting again in December.

Advice and Assistance.

The writer has made calls and otherwise given advice and assistance as follows at the request of people residing in and around the city:

At the request of officials calls were made at Fort Kamehameha and Pearl Harbor.

Visits to places in the city, 9; requests for advice by telephone, 15; requests for advice at the nursery, 19; requests for advice by letter, 6; total, 49.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

FOREST CONDITIONS ALONG VOLCANO ROAD.

Honolulu, December 29, 1915.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I beg to present herewith a special report on the forest conditions along the Volcano Road, Hawaii.

Olaa Forest Park Reserve.

This forest reserve was created on August 20, 1914, and consists of three sections, A, B and C, between 20 Miles and 18 Miles on the Volcano road.

Section B.

This part of the Olaa Forest Park reserve is at 29 Miles and contains 7.32 acres. It consists of the koa grove which was

reserved out of the Olaa summer lots, and is now one of the attractions to tourists who visit the volcano, on account of the natural grove of koa trees, which is about the only one in this immediate vicinity, on account of the beautiful tree ferns, and in particular on account of an immense koa tree of peculiar growth.

Under authority previously granted me by the Board, I have had this section of the Olaa Forest Park reserve enclosed with a Page woven-wire, 13 bar, hog-proof fence. The construction of this fence was completed on December 9 so that now the section is absolutely protected from all stock. The fence was satisfactorily constructed by the contractor, Mr. A. J. W. MacKenzie. The total cost of the fence was $260.27, of which the Bernice P. Bishop Estate paid $39.40 as their share of half the cost of the fence along the Keauhou boundary.

Section A.

This part of the Olaa Forest Park reserve consists of 374 acres of a splendid ohia lehua and tree fern forest at 24 Miles. Here is situated the most interesting native forest on the drive from Glenwood to the volcano, and it is well worth preserving in its natural condition. Cattle from the dairies in the region of Glenwood are beginning to work in to the edges of this reserve, and unless it is soon protected by fencing the forest will begin to die back. In order to preserve this forest, therefore, it is necessary that its boundaries be fenced immediately. The government surveyor has recently had the boundary lines re-run, brushed out and flagged preparatory to the construction of a fence. The total distance of the boundaries of the four pieces of land in this reserve is approximately 29,641 feet or about 5.62 miles.

Attached herewith are specifications for a proposed fence around the boundaries of Section A of the Olaa Forest Park reserve, and, if they are acceptable to the Board, I recommend that I be authorized to advertise for bids for the construction of this fence and proceed with the work. The Board already has a sufficient quantity of durable wire for this fence, and, since the posts will be cut locally, practically the only cost will be for the labor of cutting and setting the posts and stringing the wire. In order to guarantee efficient work on this job, I propose to require the successful bidder to furnish a satisfactory bond with the contract.

Section C.

This part of the Olaa Forest Park reserve consists of 56 separate pieces of land in the form of strips 150 feet wide and from 150 feet to 2000 feet long along both sides of the Volcano road between 18 Miles and about 23½ Miles. These strips were reserved out of the Olaa lots which were sold by the government

some time ago, the idea being to preserve as a park this fringe of forest along both sides of the main Volcano road. The idea was good but the strips, only 150 feet wide, were too narrow to allow the forest to maintain its integrity in opposition to the land clearing on private property just back of these strips. The strips themselves were not fenced to keep out cattle and owing to the adjacent clearing and to marauding stock, the result now is that most of these forest strips consist of dead trees with a scrubby undergrowth of ferns and Hilo grass. This is particularly true of the strips consisting of 41 separate pieces of land between 18 Miles and Glenwood, which is at the 22-Mile post. If the land back of these strips on this section were government land there would be some chance perhaps to reclaim this dead and dying forest, but under present conditions, with the cattle from the numerous dairies in this region wandering promiscuously about, I see no use of going to the great expense of fencing these 41 pieces of land containing mostly dead forests. Moreover, an application has recently been received from the land commissioner for the release from Section C of the Olaa Forest Park reserve of the denuded strips adjacent to 7 of the Olaa lots situated between 18 Miles and 22 Miles, so that they can be sold to the owners of the adjacent lots.

I wish to recommend, therefore, that the appropriate steps be taken to eliminate from Section C of the Olaa Forest Park reserve the 37 pieces of land consisting of strips 150 feet wide and from 150 feet to 2000 feet long on each side of the Volcano road between 18 Miles and 22 Miles. I suggest that the matter of this elimination first be laid before the Hilo board of trade before final action is taken by this Board.

Between Glenwood, at 22 Miles, and Section A of the Olaa Forest Park reserve at 23½ Miles the forest on the 15 strips of reserved forest land has not been damaged to such an extent but that it can be reclaimed by protective fencing. In my judgment this part of Section C of the Olaa Forest Park reserve should be retained and properly fenced as soon as the opportunity presents itself.

In a word, it seems to me that the policy of the Board in connection with the forest reserves in this region should be to fence the reserved forests where the forest is still in a healthy condition and give them absolute protection, and release for disposition by the land commissioner the reserved strips on which the forest is dead or in such a dying condition that it cannot be reclaimed except at an enormous cost.

Proposed New Forest Reserve at Waiakea.

While on my recent trip in this region the deputy territorial veterinarian for Hawaii pointed out to me the forest on an old lava flow along the Volcano road between about 4½ Miles and

the Puna boundary at about 7 Miles. This is the first forest of ohia lehua, kukui and other native trees which the tourist sees after leaving Hilo for the volcano, and it is a forest region well worth protecting for its scenic value. The forest is in a fairly healthy condition and where a fire swept over it some years ago the young ohia trees are coming in, in a healthy and satisfactory condition. The forest is situated on land which is too rocky for any agricultural use with the possible exception of raising awa root. There should, therefore, be no objection to including this land in a forest reserve, subject, of course, to the expiration of the Waiakea lease, which expires on June 1, 1918. I have talked over this proposed forest reserve with the land commissioner and he is favorable to its creation. If the Board also looks with favor on this proposed reserve, I shall proceed to obtain a description of it and submit a more detailed report preparatory to the usual process of creating it as a forest reserve.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

ARBOR DAY REPORT.

Honolulu, November 30, 1915.

Superintendent of Forestry, Board of Agriculture and Forestry.

Dear Sir:—I herewith submit a special report on the distribution of trees for Arbor Day. The planting of trees on Arbor Day is attracting more attention each year. The total distribution of plants for Arbor Day planting this year amounted to 20,583, all of which, with very few exceptions, were pot grown trees. For 1914 the total distribution for Arbor Day was 17,595, the increase for 1915 being 2998. The number of trees distributed to homesteaders on Kauai and Maui is much larger this year than last year. The total distribution to the schools is also about 1200 more than in 1914.

The following tables show how the trees were distributed:

Distribution by Islands.

	Trees
Oahu—Outside Honolulu—homesteaders and others	3,426
Military posts	1,600
Honolulu and neighborhood	4,676
School children on Arbor Day, 1 tree each	1,350
Total for Oahu	11,052

Total for Hawaii	1,252
Total for Maui	3,048
Total for Kauai	3,129
Total for Molokai	68
	18,549

Schools.

Oahu—Outside Honolulu	3	schools	40
Honolulu and neighborhood	20	"	567
Hawaii	2	"	67
Kauai	3	"	235
Maui	13	"	1,101
Molokai	1	"	24
Total	42	"	2,034

Summary of Plants Distributed.

Oahu (including Honolulu)	11,052
Hawaii	1,252
Kauai	3,129
Maui	3,048
Molokai	68
Schools on all islands	2,034
Grand total	20,583

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, December 4, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during November, 1915, is submitted:

Weather Conditions.

The rainfall was excessive generally over all islands. During the week ending November 13, the rainfall was particularly heavy over the entire group. The Nuuanu Pali rain gauge registered about 31 inches for the month, the heaviest monthly rainfall recorded since the register was established in 1911. On Kauai the streams and ditches were all above normal during the entire

month, but no excessive floods occurred. Large floods occurred on Oahu, Maui and Hawaii, and on Hawaii considerable damage was done by high winds and floods.

Special Reports.

A special report relative to the amounts diverted under each territorial land lease and water license on East Maui, was prepared and furnished the Governor of Hawaii, at his request. The data contained therein are to be used in determining the rentals to be assessed under these leases and licenses in the future. Copies of this report are attached hereto.

From November 17 to 20 was spent on the island of Kauai inspecting new construction work and gathering records and evidence as to the mean daily and annual flow of ditches diverting territorial waters from the Waimea, Anahola, Kapaa and North Wailua rivers.

These records are now being analyzed and computed and, when in proper form, will be incorporated in a report to the governor to assist him and the commissioner of lands in determining the future water values of these streams.

One copy each of the topographic maps of Kauai and Oahu has been colored to show information relative to military reserves, hydrographic data, homesteads, forest reserves, etc., at the request of the governor. One copy of the map of Oahu has also been similarly prepared for the Division of Forestry.

New Construction.

Kauai. Very little was accomplished during the month on account of high water in the streams which prevented all excavation work.

Oahu. Two new reinforced concrete weirs were established on the upper reaches of the middle and east branches of the Malaekahana streams near Kahuku. These stations will measure the flood flow of these streams in connection with a possible billion-gallon storage project near Kahuku. These weirs will replace those originally established at the expense of the Kahuku plantation in 1914, which were damaged by heavy floods. The plantation paid about one-half of the cost of the new construction work.

Routine Operation and Maintenance Work.

Kauai. No trail repair work was possible on account of steady rains.

D. E. Horner and the Japanese laborer who were injured on October 28 returned to work on November 10 and 12.

Twenty stream and ditch measurements were made and 20

stream and ditch measurement stations were visited. Sixteen days were spent by Mr. Hardy and Mr. Horner on computations and office work.

Oahu. Measurements made the latter part of the month on the Waiahole tunnel project showed about 13 million gallons per day flowing from the north portal, and about 6 million gallons per day from the south portal. Twenty-eight stream and ditch measurements at regular stations, and two miscellaneous measurements were made. Three rainfall stations and 44 stream and ditch measurement stations were visited and inspected.

Maui. But one stream measurement was made and one rain measurement station visited. All continuous record stream measurement stations were inspected.

Molokai and Hawaii. The usual rainfall records were received from coöperative observers.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

BOARD APPOINTMENTS.

Commissions were issued by the Board of Agriculture and Forestry during the year 1915 to the following:

January 16—C. S. Judd, Superintendent of Forestry.

April 28—C. S. Judd, Executive Officer.

April 28—John S. Goodell, District Fire Warden, District of Koolau, Maui, east of Makapipi Gulch.

April 29—Frederick Muir, Field Entomologist.

May 1—Kaina D. Lovell, Forest Ranger, Kauai.

July 1—David T. Fullaway, Field Entomologist in Charge of the Expedition to India.

October 7—Herbert T. Osborn, Field Entomologist for the Collection of Beneficial Insects.

October 13—Dr. H. B. Elliot, Deputy Territorial Veterinarian for the Island of Hawaii.

November 15—E. H. Hipple, Forest Ranger for Palolo, Manoa and Nuuanu Valleys in the Honolulu Watershed Forest Reserve.

December 1—John Pililaau, Forest Ranger for Waianae, Oahu.

KOA SUITABLE FOR ARTIFICIAL REFORESTATION.

By C. S. Judd, *Superintendent of Forestry.*

That our native koa (*Acacia koa*) is very suitable for artificially reforesting our denuded slopes has been proved by the planting operations of the Division of Forestry on the Honolulu Watershed forest reserve which were begun in November, 1913. The accompanying illustration shows one of the koa trees which, although slightly over two years old, is already fourteen feet high and four inches in diameter at the base. Koa trees were planted on the upper slopes of the Makiki valleys fifteen by fifteen feet apart and already on Sugar Loaf the growth has been so rapid that before very long a solid forest canopy will be established.

On the lower slopes and in the valleys kukui trees were planted and these too are showing up very well. Before long, all of this part of Honolulu's source of water supply will consequently receive better protection by this reëstablished forest. Both koa and kukui are easy to raise from seed and easily handled in planting operations.

A SIDELIGHT ON THE MAUI FOREST TROUBLE.

By C. S. Judd, *Superintendent of Forestry.*

The death of native trees in the Koolau forests on Maui, which began in 1906, was ascribed by Mr. H. M. Curran primarily to heavy winds, acting on the forest, the normal vigor of which had, by adverse soil conditions, excessive moisture, and the opening of the forest by grazing and ditch construction, been reduced to a point where it was unable to withstand any further increase of unfavorable conditions.

The trouble was determined by Dr. H. L. Lyon to be due directly to chemically active agents in the soil which killed the roots which penetrated the soil to a depth of two inches or more. The trees that were thus killed were located mostly on the flat ridges where the drainage was poor and where there was an abundance of standing water. Every variety of tree in the affected area succumbed to the attack.

A sidelight on this trouble comes from the other side of the globe and is described in the *Indian Forester* of October, 1915. In Northern India there has been a widespread death of the seedlings of sal, *Shorea robusta*, the most extensively used timber tree of that region. Studies made at Dehra Dun of the trouble, which comes into operation in the rainy season, especially in the months of July and August, have ascribed the cause to "an injurious soil factor" produced by lack of sufficient oxygen for root-respiration combined with the presence of toxic substances in the soil which are directly poisonous to the roots. The cause



Two-year old koa tree on Sugar Loaf, Honolulu Watershed Forest Reserve. Height, 14 feet, Diam., 4 in.

of the former is bad drainage and the latter are probably produced as a result of the decomposition of the organic matter in the soil.

The "injurious factor" tends to exert itself during the rains and especially in low places where water tends to accumulate.

The cure for the trouble, suggested by the Indian study, is soil-aeration and the removal of excessive organic matter from the soil surface. The experiments showed that when the soil was well drained, with less water and a larger air-space, the injurious factor was practically inoperative and was gradually neutralized by merely keeping the surface soil exposed to the air and clear of dead sal leaves.

The diagnosis of the Maui trouble by Mr. Lyon and his prescribed remedy, soil drainage, are so similar to those relating to the trouble in India that it would appear that the cause of the trouble is significantly the same.

FIGHTING RABIES IN FAR WEST.

(The following article, furnished by the U. S. forest service, was received just too late to be printed, in connection with the editorial reference to precautions against rabies here, in the January number. Under date of January 14 a San Francisco despatch reports the danger from coyotes infected with rabies as having become acute in California, with the beasts attacking farmers and school children, and schools having to be closed, in counties bordering upon Oregon and Nevada.)

The Department of Agriculture is taking action, through the biological survey and the forest service, to combat a serious wave of rabies infection of wild and domestic animals that is in danger of becoming widespread in the far West. The fact that the extensive dissemination of the disease is taking place through the agency of coyotes makes the situation a difficult one to meet.

Outbreaks of rabies among coyotes have been noted from time to time for several years in parts of Washington, Oregon and northern Idaho, and the forest service undertook last year to aid in bringing the disease under control by employing hunters to make war on coyotes in the national forests of some infected localities. Since, however, the coyotes breed in the foothills and around the outskirts of the forests, a more comprehensive campaign is called for.

The eradication of coyotes in sparsely settled or rough country is said to be an exceedingly difficult task. Inasmuch as these animals are always a source of considerable losses to the live-stock industry of the West, Congress last year provided a special fund of $125,000 to be spent by the biological survey for the eradication of predatory animals both in the national forests and on the public domain, and from this fund a special allotment has now been made to provide for fighting the rabies.

The disease first appeared in parts of eastern Oregon and Washington and northern Idaho, in a region surrounded by natural barriers which tended to confine the outbreak. Domestic animals and human beings were bitten, and a good deal of alarm was manifested by residents of the infected districts, many of whom feared for the safety of their children on the roads to and from school. The disease is now reported as having extended into northern Nevada and northern California, whence it may easily be carried far.

The forest service, the biological survey and the state board of health are working together to meet the situation in California. Modoc and Lassen counties have been put under quarantine by the state board, which has appointed forest rangers inspectors in Modoc county. Funds have been provided by the biological survey for the employment of additional men and the purchase of traps and poison. The public will be enlisted in the campaign, which will be led by the biological survey officials and the forest rangers.

BY AUTHORITY.

BIDS FOR FOREST FENCING.

Sealed bids marked outside "Bids for Forest Fencing, Olaa, Hawaii," and addressed to the Superintendent of Forestry, P. O. Box 207, Honolulu, Hawaii, for the construction of a stock-proof fence around Section A of the Olaa Forest Park Reserve at 24 Miles on the Volcano Road, Puna, Hawaii, will be received up to and including January 29, 1916. Bids to be submitted in a lump sum for the job as a whole, and to be accompanied by a certified check, payable to the undersigned, for a sum equal to 5 per cent of the amount bid. The right is reserved to reject any or all bids. Specifications may be obtained on application from the undersigned.

C. S. JUDD,
Superintendent of Forestry, and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Hawaii, January 7, 1916.

TERRITORY OF HAWAII
BOARD OF AGRICULTURE AND FORESTRY
DIVISION OF FORESTRY

INFORMATION CONCERNING PROPOSED FENCING OF THE OLAA FOREST PARK RESERVE, SECTION A, PUNA, HAWAII.

Bids marked outside "Bids for Forest Fencing, Olaa, Hawaii," and addressed to the Superintendent of Forestry, P. O. Box 207, Honolulu, Hawaii, will be received for the construction of a stock-proof fence around this reserve, up to and including January 29, 1916.

The total length of the fence, which is to be stock-proof and constructed according to the attached specifications, is 29,641 feet, more or less.

The location of this proposed fence is shown by the yellow lines on the enclosed blue print map. The location of this fence on the ground has recently been surveyed and the lines brushed out and distinctly flagged.

Bids should be submitted in a lump sum for the work as a whole. Bids must be accompanied by a certified check for a sum equal to 5 per cent. of the amount bid, payable at sight to the undersigned.

The right to reject any or all bids is reserved.

The successful bidder will be required to furnish with the contract a satisfactory bond in an amount equal to 25 per cent. of the accepted bid.

C. S. JUDD,
Superintendent of Forestry, and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Hawaii, January 7, 1916.

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Board of Agriculture and Forestry

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN

FORESTER & AGRICULTURIST

VOL. XIII. MARCH, 1916. No. 3

NEW COMMISSIONER OF BOARD.

Mr. A. L. C. Atkinson was on January 27, 1916, appointed a Commissioner of the Board of Agriculture and Forestry by Governor Pinkham to fill the vacancy caused by the resignation of Mr. Albert Waterhouse. Commissioner Atkinson comes into office with an intimate acquaintance of Territorial affairs and a special knowledge of animal industry that will be very helpful to the Board.

The vigorous campaign against bovine tuberculosis conducted by the Division of Animal Industry resulted, at the end of 1915, in freeing 90 per cent of the local dairies from tubercular infection. It is safe to say that before another year passes this scourge will be almost completely, if not entirely, wiped out by the present vigorous method of testing, the segregation and slaughter of reactors, and the thorough disinfection of premises which have harbored diseased cattle.

The service rendered by Superintendent G. K. Larrison of the Division of Hydrography in assisting in locating the leak in the outlet pipe of the No. 4 Nuuanu reservoir should be followed up by the proper repairs in order to make the dam, which Mr. Larrison says is practically water-tight and absolutely safe, serve its greatest usefulness to the people of Honolulu.

The recent heavy kona rains inundated the Honolulu animal quarantine station on the Ala Moana, but owing to the substantial construction of the kennels, taxed to their utmost with dogs in quarantine, the concrete foundations and the elevated sleeping floors, sickness and death among the dogs were avoided.

The protection of the large block of native ohia and tree fern forest at 4 Miles on the Volcano road by proposed fencing, now under contract as elsewhere reported, is another step in the proper administration of our forest reserves, the benefits of which will be appreciated in later years.

Superintendent Ehrhorn's remedies for cutworms and rose mildew, presented in this number, may be of timely assistance to those whose plants are at present afflicted with these pests. Advice on combating other pests will be gladly given, upon request, by the Division of Entomology.

The importation of 50 Merino rams from Australia during December by the Parker Ranch is an indication of the modern progressiveness of the management of this ranch.

Superintendent Larrison's article on the Waiahole tunnel project in this issue will be of interest to those readers to whom the accomplishment of great engineering feats appeal.

DIVISION OF FORESTRY.

Honolulu, January 17, 1916.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of December, 1915:

Government Land in Waimalu Valley.

In my report for November I mentioned my first trip to Waimalu valley, Oahu, to locate a small piece of government land, called Waholoa in the Ewa forest reserve. On December 20, 1915, I made another visit to this land and secured evidence to refute the claim that it does not belong to the government. On December 22 the matter was referred to the Attorney General for adjustment.

Claim of Thomas Makia, Waianae Reserve.

Subsequent to my visit on November 30, 1915, to the Waianae-kai forest reserve, when I served notice on Mr. Thomas Makia to move a portion of his fence, as instructed by the Board on November 4, I received a letter from his attorney stating that, previous to the inclusion of this land in the forest reserve, Mr. Makia had made application to purchase it under a preference right. Upon further inquiry at the Land Office I found this to be so, although it was diametrically opposite to the statement which I had received, from the Land Commissioner, in answer to my previous inquiry on the matter, and to the statement made to me on October 21, 1915, by Makia himself that he claimed no legal right to the land. Under these developed circumstances there was, therefore, no ground on which the granting of a preference right to this land to Makia could be opposed. Mr. Makia's attorney has, however,

instructed him to comply with the Board's requirement to move the fence.

Hawaii Trip.

The matters investigated during my trip to Hawaii from December 9 to 11, 1915, have already been made the subject of a special report which has received your consideration. Briefly, this special report announced the completion of the hog-proof fence around Section B of the Olaa Forest Park reserve, called the Koa Grove, at 29 Miles on the Volcano road; the plan of fencing at once Section A of this reserve in the region of 24 Miles; the proposed elimination of some of the reserved narrow strips in Section C along the Volcano road, on which the native forest was mostly dead; and the proposed creation of a new reserve to include wide strips of land in Waiakea along the Volcano road.

On this trip I also inspected the sub-nursery at Hilo, in charge of Br.Matthias Newell, and found everything satisfactory.

Trees Planted in 1915.

In order to obtain more complete information than in the past on the number of trees planted annually, I prepared and mailed out eighty-five reply postal cards to tree planters in the Territory on the last day of the year. The reply cards, most of which have already been returned, give not only the total number of trees planted during the calendar year 1915, but also the species, the purpose and the locations of planting. This complete information will make our statistical report on the subject of greater interest.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

Report of Forest Nurseryman.

Honolulu, January 15, 1916.

Superintendent of Forestry, Board of Agriculture and Forestry:

Dear Sir:—I herewith submit a report of the principal work done during the month of December, 1915:

Nursery.

Distribution of Plants.

	In seed boxes.	In boxes transplanted.	Pot grown.	Total.
Sold			575	575
Gratis		2600	2147	4747
		2600	2722	5322

Collections.

Collections on account of plants sold amounted to.....$ 9.15
Rent of Building, Nursery Grounds, for November..... 35.00

Total.....$44.15

Plantation Companies and Other Corporations.

The distribution of plants under this heading is as follows: Trees in seed boxes, 15,000; in transplant boxes, 2,550; pot grown, 1,900; total, 19,450.

Makiki Station.

The work at this station has been principally transplanting and potting plants, mixing and sterilizing soil and doing other routine work.

Honolulu Watershed.

Owing to excessive rains a great deal of hoeing and weeding has had to be done. The men have been doing this work and practically all the recently planted trees have been gone over. During the month of January we intend doing more planting, also clearing of the lower end of Herring valley.

Advice and Assistance.

The writer has been requested to make calls and otherwise give advice and assistance as follows:

Calls made to places in and around the city, 12; advice given by letter, 3; advice given by telephone, 14; people calling at the nursery, 9; total, 38. In addition to the above a number of tourists and others have called at the nursery for information and sample packages of seed.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

DIVISION OF ENTOMOLOGY.

Honolulu, January 15, 1916.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of December, 1915, as follows:

During the month 39 vessels arrived at the port of Honolulu of which 23 carried vegetable matter and one vessel moulding sand.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1259	35,760
Fumigated	1	1
Burned	70	70
Returned	4	4
Total	1334	35,835

Of these shipments 35,535 packages arrived as freight, 129 packages as mail matter and 171 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 19,126 bags of rice and 1487 bags of beans arrived from Japan and 1132 bags of corn from Manchuria which, after thorough inspection, was passed as free from pests.

Pests Intercepted.

Fifty-four lots of fruit and 9 lots of vegetables were taken from passengers and immigrants coming from foreign countries and were destroyed by burning. A package of citrus fruit in the baggage of a Filipino when taken was found infested with a large scale insect (*Pseudaonidia trilobitiformis*). Some orchids in a shipment from New Jersey were infested with the orchid scales (*Chrysomphalus biformis* and *Diaspis boisduvalii*). One package of seeds and two packages of plants were found in the foreign mail and were returned to the sender by the postmaster as being unmailable under the ruling of the Federal Horticultural Board.

Two shipments of beneficial insects were received from Mr. Fred Muir from Manila through this division and turned over to the H. S. P. A. after careful examination by the undersigned at the Planters' station.

Beneficial Insects.

During the month of December the following parasites of fruit flies have been bred:

Tetrastichus giffardii	13,500
Diachasma fullawayi	827
Diachasma tryoni	598
Total bred	14,925

Including the usual number of parasites of the horn, house and stable fly, as well as the usual emergence of *Opius humilis* bred at the insectary, the following parasites were liberated in various sections:

Tetrastichus giffardii	10,800
Diachasma fullawayi	818
Diachasma tryoni	601
African Spalangia	600
Philippine Spalangia	700
African Hornfly	800
Philippine pteromalid	500
Total distributed	14,819

The breeding of the mealybug parasite (*Paraleptomastix abnormis*) is kept up but on account of heavy rains these delicate parasites have not been liberated.

Hilo Inspection.

During the month of December Brother Matthias Newell reports the arrival of seven steamers, six of which brought vegetable matter, and one sailing vessel bringing lumber. The fruit and vegetable shipments consisted of 237 lots and 5068 packages, all of which were found free from pests except two cases of turnips which had to be cleaned from dirt before passing them for delivery.

The T. K. K. steamer Saiyo Maru arrived direct from Japan bringing 2250 bags of rice, 257 bags of beans and 10 bags of peanuts, all of which were found free from pests and passed.

Inter-Island Inspection.

During the month 64 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	667 bags
Plants	165 packages
Vegetables	64 packages
Fruit	11 packages
Total passed	907 packages

The following packages were refused shipment on account of infestation, and the plants on account of having undesirable soil attached to their roots:

Plants	6 packages
Fruit	12 packages
Total refused shipment	18 packages

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, January 24, 1916.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month of December, 1915, as follows:

Bovine Tuberculosis Control.

As will be noted from the appended report of the Assistant Territorial Veterinarian, the annual testing of dairy stock for tuberculosis on the island of Oahu has been finished with a grand total of more than 7000 tests, 216 of which gave positive results. This means about 3 per cent. of reactors, or apparently an increase of one per cent. over last year's result, a condition which would be very discouraging were it not for the fact that not less than 45 reactors were encountered in herds tested this year for the first time, in other words in herds that, strictly speaking, cannot be called dairy cattle, but from which milch cows are drawn from time to time. If these herds, comprising 672 head with nearly 7 per cent. of reactors, were deducted from the grand total, the percentage of reactors in general would be reduced to 2.7. When it is further remembered that 50 reactors were found in two dairies (see report for July) where no testing had been done for sixteen months, and where the disease, consequently, had spread rapidly, it will be found that taken all

together there is a decided improvement in the bovine tuberculosis situation in the City and County of Honolulu. With the slaughter or segregation of all the reactors (see Dr. Case's report) and with the thorough disinfection of all the premises where reactors have been found, it may safely be claimed that at least 90 per cent. of the local dairies are now, at the end of 1915, free from tubercular infection.

Equally satisfactory conditions can be reported from the other islands where the new sanitary code of the Territorial Board of Health has supplied the long needed authority for a vigorous campaign against this disease. The three deputy Territorial veterinarians are now coöperating with the representatives of the said Board in their respective districts and no territorial dairy permit is issued until a certificate of tuberculin test has been issued by one of the deputies of this Board, and the reacting animals removed. Under these conditions the complete eradication of bovine tuberculosis will require only the coöperation of the owners of the few remaining herds where the infection still persists, in order to be an accomplished fact by the end of 1916. The over-production of milk in certain localities speaks volumes in support of the contention adhered to by this Division that no hardships have resulted from the bovine anti-tuberculosis campaign, except possibly to milk consumers of the poorer classes.

The Hog Cholera Situation.

The three or four outbreaks of hog cholera reported on last month have all been suppressed by the aid of serum injections. First class market hogs are now being produced in such numbers as to cause a decided reduction in the price paid to producers, though hardly as yet in that paid by the consumer. If conditions continue along the same favorable lines of development, it will not be long before pork packing will have to be established here as a permanent industry.

Considerable areas are now being planted to hog feed, or hog pastures, on all of the islands, and some satisfactory arrangement will undoubtedly result whereby hog raising (breeding) and hog feeding, on Oahu at least, will become two separate industries according to the class of feed available. Swill or kitchen offal will always remain a more or less dangerous feed, for young animals especially, while on the other hand it is a highly nutritious and as a rule cheap feed when used intelligently. For young pigs, and often for brood sows, it should be used but sparingly, if at all, and the difficulty of keeping premises where swill is fed in a thoroughly sanitary condition also points to its most advantageous use as a feed for the more resistant classes of hogs.

Pasture is practically indispensable for the economic raising

of pigs, and Sudan grass seems to be very promising for this purpose, though, of course, it can never take the place of alfalfa.

A recent movement on the part of some of the local hog raisers to form an association would seem to be a step in the right direction. There are certain vexing questions in connection with this branch of the local live stock industry which can only be satisfactorily settled by obtaining the opinion and views of all the hog raisers in the Territory. Any desired reforms, expressed by a decided majority of a duly organized association, would naturally receive the earnest consideration of the Commissioners of Agriculture and would constitute an assumption of responsibility for the consequences of such reforms as to facilitate a decision which otherwise might seem difficult or even risky. In many other ways such an association could be made of great economic value, in the purchase and exchange for instance of high priced breeding stock, the establishment of serum depositories, in coöperative marketing or purchase of supplies, the dissemination of pamphlets or the circulation of standard works on hog breeding and feeding, and finally in obtaining certain agreed-upon experiments pertaining to hog raising carried out by the official agricultural and experiment stations and colleges.

A new rule and regulations, designed to make more effective the Territorial statute requiring the early report of outbreaks of infectious diseases of animals, has been prepared and is now being circulated among the deputy Territorial veterinarians on the other islands for such suggestions as their respective observations and experiences might lead them to consider advisable. When their replies have been received the entire subject will be submitted for the Board's consideration.

Rabies in the United States.

That the efforts of this Board to control the introduction of dogs into the Territory were timely will be seen from the fact that rabies has become endemic in Northern California, Oregon and Washington to such an extent as to require the aid of the federal authorities in its suppression. Bands of coyotes mad with the rabies virus are said to infest the districts mentioned, attacking any live being, whether human or animal, that they come near, and even entering farm yards, schools and houses in their frenzied efforts to relieve their insufferable pain by biting. The U. S. Congress has appropriated $50,000 and ordered all forest rangers in the three states mentioned to hunt the coyotes, skunks and dogs in the infected districts.

In this connection it may be stated that more dogs have been arriving here of late, with tourists or returning visitors to the mainland, than at any previous period, and that the dog quarantine station at times has been taxed to its limits. When to this is added the fact that the torrential rains of the past few weeks

have at times practically inundated the station, it is safe to say that, except for the substantial construction of the kennels, the concrete foundations and the elevated sleeping floors, sickness and deaths could hardly have been avoided. The new hospital building also proved of great value in housing the more delicate animals and protecting them against the prolonged cold dampness of the period. As it is, no disease has made its appearance even though the mosquitoes have begun annoying the short-haired dogs to a considerable extent. If at least half of the kennels could be made mosquito proof, I believe it would be a defensible expenditure, as quite a number of dog owners are very anxious to have their pets protected against these pests, especially dog owners who have heard about the heart worm being transmitted by mosquitoes.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, January 18, 1916.

Dr. V. A. Nõrgaard,
Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows for the month of December, 1915:

Tuberculosis Control.

During the past month the following dairy herds were tested:

	Tested.	Passed.	Condemned.
Kawailoa	227	227	0
Kahuku	810	804	6
Malaekahana	319	318	1
Mokuleia	359	357	2
Honouliuli	4	4	0
Kunia	641	639	2
Waimanu	104	102	2
F. de Mello	13	13	0
M. Okomoto	7	7	0
S. Saito	8	8	0
F. Fugita	3	3	0

From the above list it will be seen that a total of 2495 animals were tested, out of which number 2482 were passed and tagged, and 13 condemned and branded.

This finishes the annual tuberculin test for 1915, the total figures for which are as follows:

Tested.	Passed.	Condemned.
7004	6788	216

The percentage of condemned animals being 3.08 per cent. or an apparent increase over 1914 of 1 per cent. This increase of condemned animals can be largely accounted for by the large total —45 animals—condemned on ranches tested for the first time. Of the above 216 animals condemned, only 10 remain alive at the present writing and these are carefully segregated awaiting slaughter.

Importation of Live Stock.

S. S. Manoa, San Francisco: 25 cts. poultry, 2 cats, Dr. Huddy.

S. S. Niagara, Vancouver: 1 dog, C. H. C. Hobson.

S. S. Ventura, Sydney: 25 Merino rams, Parker Ranch.

S. S. Matsonia, San Francisco: 32 cts. poultry, 1 dog, P. Collins.

S. S. Lurline, San Francisco: 20 mules, Schuman Carriage Co.; 1 mule, Haw. Pres. Co.; 11 horses, C. Brewer & Co.; 1 horse, W. F. Ex. Co.; 2 horses, U. P. Transfer Co.; 2 Holstein bulls, D. P. R. Isenberg; 1 Holstein bull, C. W. Lucas; 38 cts. poultry.

S. S. Minnesotan, Seattle: 6 swine, 6 cows, 2 sheep, 25 mules, 2 horses, 3 bulls, 11 heifers, A. L. Macpherson.

S. S. Manoa, San Francisco: 2 Duroc-Jersey boars, C. M. Cooke; 1 monkey, W. F. Ex. Co.; 41 cts. poultry, 2 Hampshire hogs, W. F. Ex. Co.

S. S. Sonoma, Sydney: 25 Merino rams, Parker Ranch; 1 cat, Mr. Jaeger.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF HYDROGRAPHY.

Honolulu, January 17, 1916.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during December, 1915, is submitted:

Weather Conditions.

The rainfall from December 1 to 24 was light over nearly all

of the Territory. A heavy kona storm broke over the islands on the evening of the 24th and reached its maximum intensity on the 25th with rainfall above normal during the following four days. The heaviest rainfall on Oahu occurred at Waialua, 6.90 inches, on December 28; and at Koloa, Kauai, 7.51 inches fell in 24 hours.

Heavy gales caused much damage to shipping and property. The maximum wind velocity recorded at Honolulu was 34 miles per hour on the 27th and 28th. From the damage done at Schofield Barracks the wind velocity must have reached at least 60 miles per hour.

Streams, ditches and reservoirs are well supplied with water and there is plenty of water in sight for all purposes for the near future.

Special Reports.

A special report, relative to a suggested method of fixing water rental rates for future water licenses issued by the Territory of Hawaii, was made to the Governor of Hawaii at his request.

A special report showing the quantities and valuation of Territorial waters on the islands of Kauai, Oahu and Maui was also prepared and submitted to the Commissioner of Public Lands at the request of the Governor of Hawaii.

Special reports were also made to the Governor of Hawaii relative to the quantities and possible valuations of North Wailua and Waimea waters on the island of Kauai.

Copies of all of the above reports are attached hereto.

Special Investigations.

At the request of Mr. T. F. Sedgwick, acting for the Oahu Loan Fund Commission, an investigation was made to determine the leakage and cause thereof from Reservoir No. 4 in the upper Nuuanu valley.

This investigation proved undoubtedly that the greater part of the loss from this reservoir is due to a break in, or faulty construction of, the outlet pipe inside of the dam structure and that, should this leak be eliminated, this dam is practically watertight and is absolutely safe. A copy of the report of this investigation is attached hereto.

Three days were spent on East Maui endeavoring to locate suitable sites for ditch measurement stations which will, in the future, produce accurate data as to the amounts of water diverted from Territorial lands under each of the five large water licenses now in effect. This investigation will be completed in January, 1916.

Construction Work.

Kauai.—The new continuous record stream measurement station on the Waialae branch of the Waimea river was completed and the record started on December 31, 1915.

Oahu.—The cable foot-bridge on the Kalihi stream used for flood measurements was rebuilt.

Operation and Maintenance Work.

Kauai.—The trails leading to the high level stream measurement stations on the Waioli, Lumahai, and Wainiha streams were cleared and are now in good condition. Twenty-two stream and ditch measurements were made and 15 rain gauges were visited. A reconnaissance was made of the Kalama stream and two measurements were made. This stream may be diverted to serve some of the Kapaa homesteads.

Oahu.—The discharge from the north or Waiahole portal of the Waiahole main tunnel was measured on December 21 and found to be about 8.0 million gallons per day. The discharge from the Waiawa portal at the same time was about 4.0 million gallons per day. Later reports indicate a still further decrease in the discharge from both portals.

A reconnaissance of the ditches diverting water from the Nuuanu stream was made. These data will be included in a report relative to surface water flow and utilization in the immediate vicinity of Honolulu, now being prepared.

All stream, ditch and rainfall stations, excepting those in Kahanaiki and Kailua valleys, were visited. Twenty-three measurements were made at regular stream and ditch stations and seven miscellaneous measurements were made.

Maui.—R. D. Klise, assistant engineer, spent the greater part of the month on East Maui, repairing and improving stream measurement stations, clearing trails, etc.

C. T. Bailey, assistant engineer, and G. K. Larrison, superintendent, spent several days on reconnaissance to select locations for ditch measurement stations to be used for the determination of the amounts of water being diverted under the various Territorial water licenses. Four stream and ditch measurements were made.

Hawaii.—H. A. R. Austin, junior engineer, spent the last week of the month on Hawaii collecting data and making measurements relative to waters owned by the Territory of Hawaii in the Kohala and Hamakua districts. This information will be used, in part, by the Territorial Attorney General's department in the near future.

Rainfall Records.

Annual rainfall records are being collected as rapidly as possible, and should be available for the next monthly report.

January Plans.

Kauai.—Collect and segregate all coöperative rainfall and ditch flow data available from private corporations.

Establish new measurement stations on the Kekaha and Waimea ditches.

Relocate the measurement station on the Lihue ditch to a more satisfactory location.

Oahu.—Only routine operation and maintenance work will be done.

Maui.—Complete repair work on East Maui and construct new continuous record measurement stations on the Olowalu and Ukumehame streams, which are owned by the Territory of Hawaii.

The East Maui Irrigation Company is considering the installation of a large number of stream measurement stations on the lower boundary of their "fee simple" land which lies above the Territorial lands which furnish water to the ditches of this company under three water licenses, two of which terminate in 1917 and 1919, respectively. The Wailuku Sugar Co. is also planning an intensive study of its water supply and distribution system.

A consultation with the officials of these corporations will be held early in the month, relative to handling this work by coöperation with this division.

Hawaii.—Mr. Austin will complete his field work in the Kohala and Hamakua districts and his report will be submitted to the proper Territorial officials.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

COMMISSION BUSINESS.

Extracts from Minutes of recent meetings of the Board of Agriculture and Forestry.

November 4, 1915.—President Waterhouse presented the special report of the Superintendent of Forestry recommending the appointment of E. H. Hipple as forest ranger for Palolo, Manoa and Nuuanu valleys at a salary of twenty-five dollars a month. On motion of Mr. Rice, seconded by Mr. Dowsett and unanimously carried, the recommendation was adopted to become effective on and after November 15, 1915.

President Waterhouse presented the special report of the Superintendent of Forestry recommending the appointment of John Pililaau as forest ranger for the Waianae district, Oahu, at a salary of twenty dollars per month to take effect December 1, 1915. On motion of Mr. von Holt, seconded by Mr. Rice and unanimously carried, the recommendation was adopted.

President Waterhouse presented a letter from the Superintendent of Forestry in re bids for construction of fence around Olaa Forest Park reserve, stating that the only bid received had been from A. J. W. MacKenzie for a total of $260.27. This he considered reasonable and recommended acceptance. On motion of Mr. Dowsett, seconded by Mr. von Holt and unanimously carried, the executive officer was authorized to accept the bid and enter into a contract with Mr. Mackenzie according to the specifications, it being understood that the Trustees of the Bishop Estate would pay for one-half of the cost of the fence where, for a distance of 707.7 feet, it coincides with the boundary of the Estate land of Keauhou.

President Waterhouse presented a letter received from Mr. E. P. Low, requesting that he be given a hearing before the Board in regard to his occupation of the island of Kahoolawe. It was moved by Mr. Dowsett, seconded by Mr. Rice and unanimously carried, that the executive officer be instructed to arrange for a meeting between this Board and Mr. Low at any mutually convenient time.

December 2, 1915.—The President stated that Mr. Eben P. Low was in attendance by arrangement with the Board for a hearing on the question of his use and occupation of the island of Kahoolawe, and invited Mr. Low to make his statement. After a full discussion Mr. Low retired from the meeting. (A transcript of the hearing is on file with Kahoolawe matters in the Board files). After consideration it was moved by Mr. Dowsett, seconded by Mr. von Holt and unanimously carried, that the executive officer be authorized to interview Mr. Low and make a tentative proposition suggesting to him that, conditioned upon the removal by him of all goats and sheep from the island within 90 days, the Board will at the end of that time consider a proposition for Mr. Low's continued use of the island, the terms and conditions of such occupation and use to be determined upon only after the removal of all goats and sheep from the island to the satisfaction of the Board; that after such interview the executive officer prepare a letter to Mr. Low setting out the understanding arrived at and submit same for the approval of the Board.

January 6, 1916.—A transmittal letter from the executive officer with a report from the Territorial veterinarian and an application from the President of the College of Hawaii requesting a modification of Rule VII of the Division of Animal Industry to permit inter-island shipment of pedigreed hogs belonging to the College of Hawaii, was submitted by the President. After consideration it was moved by Mr. Giffard, seconded by Mr. von Holt and unanimously carried, that no modification be made.

The President submitted a letter from the executive officer transmitting an application from Mr. C. M. Hudson for extension of 60 days' time under his permit to gather awa in the Puna

forest reserve, Hawaii. It appearing in the discussion that Mr. Hudson had been unable to locate any awa up to the present and that he was further hampered by weather conditions, on motion of Mr. von Holt, seconded by Mr. Giffard and unanimously carried, the request was granted.

A special report from the Superintendent of Forestry on "Forest Conditions Along the Volcano Road," was submitted by the President together with specifications for fencing Olaa Forest Park reserve, Section A. Upon motion of Mr. von Holt, seconded by Mr. Giffard and unanimously carried, the specifications were approved and the Superintendent of Forestry authorized to proceed with the work.

It was moved by Mr. Giffard, seconded by Mr. von Holt and unanimously carried that, in accordance with the recommendation of the Superintendent of Forestry, steps be taken to eliminate from Section C of the Olaa Forest Park reserve the 41 strips of land, 150 feet wide and from 150 to 2000 feet long on each side of the Volcano road between 18 and 22 Miles, subject, however, to first laying the matter before the Hilo Board of Trade.

It was moved by Mr. von Holt, seconded by Mr. Giffard and unanimously carried, that the Superintendent of Forestry be authorized to proceed with an examination of the proposed new forest reserve on the land of Waiakea along the Volcano road and submit a detailed report.

The President submitted for approval a letter prepared by the executive officer to Mr. Eben P. Low concerning the removal of goats and sheep from the island of Kahoolawe and the future administration of the island. On motion of Mr. von Holt, seconded by Mr. Giffard and unanimously carried, the letter was approved and the executive officer was instructed to forward same to Mr. Low.

The President submitted a recommendation from the Superintendent of Entomology requesting that a commission be issued to Dr. H. L. Lyon as honorary plant pathologist for the Board. On motion of Mr. von Holt, seconded by Mr. Giffard and unanimously carried, the President was authorized to issue the commission as recommended.

ARBOR DAY, NOVEMBER 19, 1915.

By C. S. Judd, *Superintendent of Forestry.*

By proclamation of Governor Pinkham, Friday, November 19, 1915, was declared Arbor Day and was appropriately celebrated by tree planting in many parts of the Territory and by special exercises at the schools, commemorative of the day. Rains somewhat interfered with tree distribution and with the actual planting, but did not dampen the ardor of school children and other tree planters on this day.

The total number of trees distributed from government nurseries for planting on this day, which was 21,248, has been exceeded only on two previous Arbor Days, as shown by the following table:

Trees Distributed From Government Nurseries For Planting on Arbor Day.

1905	3,554
1906	2,580
1907	1,524
1908	15,703
1909	63,614
1910	30,482
1911	11,508
1912	13,645
1913	11,961
1914	17,575
1915	21,248
Total to date	193,394

The distribution of trees and plants from government nurseries on Arbor Day, 1915, was as follows:

	Trees
Government Nursery, Oahu	20,583
Sub-Nursery, Homestead, Kauai	340
Sub-Nursery, Hilo, Hawaii	325
Total	21,248

The trees and plants distributed on this day from the Government Nursery, Oahu, including trees distributed to schools on all islands, were sent out as follows:

	Trees
Oahu, including Honolulu	11,052
Kauai	3,129
Maui	3,048
Hawaii	1,252
Molokai	68
Schools on all Islands	2,034
Total	20,583

The educational feature of Arbor Day is shown by the following table of trees distributed from the Government Nursery, Oahu, to schools for planting on November 19, 1915:

			Trees
Oahu, Honolulu school children who called personally for one tree each			1,350
Oahu, Honolulu and neighborhood	20	schools	567
Oahu, Outside of Honolulu	3	"	40
Maui	13	"	1,101
Kauai	3	"	235
Hawaii	2	"	67
Molokai	1	"	24
Totals	42	schools	3,384

The other recipients of trees from the Government Nursery, Oahu, for planting on this Arbor Day, were homesteaders in the rural districts, army people on military posts, and individuals, and companies interested in planting trees for ornament, protection, and wood production.

The distribution, by species, from the Government Nursery, Oahu, for planting on this last Arbor Day was approximately as follows:

Common Name.	Scientific Name	No. of Trees
Araliaceae	*Brassaia actinophylla*	600
Blue gum	*Eucalyptus globulus*	2,000
Garland tree	*Melaleuca ericifolia*	600
Golden shower	*Cassia fistula*	1,000
Highland ironwood	*Casuarina quadrivalvis*	2,100
Ironwood	*Casuarina equisetifolia*	2,000
Iyavaki	*Peltophorum ferrugineum*	1,500
Jacaranda	*Jacaranda mimosaefolia*	500
Monterey cypress	*Cupressus macrocarpa*	1,000
Paper bark tree	*Melaleuca styphelioides*	600
Pepper tree	*Schinus molle*	1,000
Pink and white shower	*Cassia nodosa*	1,000
Pink shower	*Cassia grandis*	900
Royal poinciana	*Poinciana regia*	1,000
Silk oak	*Grevillea robusta*	1,500
St. Thomas tree	*Bauhinia tomentosa*	783
Swamp mahogany	*Eucalyptus robusta*	2,500
		20,583

THE WAIAHOLE TUNNEL PROJECT.

By G. K. Larrison, *Superintendent of Hydrography.*

The largest hydraulic engineering project ever undertaken in the Hawaiian Islands was practically completed when the two headings of the main tunnel of the Waiahole Water Company's great irrigation project on Oahu met on December 22, 1915.

Why It Was Built.

The industrial condition which brought this project to completion was, briefly, the necessity for bringing the perennial mountain streams from the windward side of Oahu, where there is little need of them, through the rough Koolau mountain range which forms the backbone of the island, to irrigate the broad, rich, semi-arid sugar lands surrounding Pearl Harbor.

Mother nature who rules so harmoniously when not tampered with by mankind, evidently did not consider the sugar industry in her plans when she arranged her layout of sunshine, rain and soil on the various islands, for she usually put the soil most suited for sugar and the sunshine on one side of the island and the abundant rainfall so necessary for sugar cane growth on the other.

The discovery of an apparently abundant supply of artesian and ground water on leeward Oahu which could be profitably pumped to serve the fields seemed to solve the problem, until the belief that this water supply was inexhaustible resulted in so many wells being driven that the water not only rapidly decreased in quantity, but deteriorated in quality. As the fields were extended to higher elevations the cost of pumping became so high and the quality of the water so low that the project of bringing the abundant and pure mountain surface waters from the windward side was developed.

The plan decided upon was to gather up the mountain streams along the windward side from the Waiahole to the Kahana valleys and to bring these via a long tunnel through the mountain range to a point where the water could be delivered to the Oahu plantation fields. It was planned not only to use the pure mountain water to mix with and rotate with the pumped water which could still be profitably pumped to serve the low lying fields and to eliminate the necessity of costly pumping to the high level fields, but also to bring under cultivation an additional area of about 3800 acres above the old fields.

The Surface Water Supply.

The greatest water supply producing area on Oahu includes the windward valleys of Waiahole, Waikane, Kahana and Puna-

luu. None of the other streams on Oahu have discharges during dry weather in excess of three million gallons daily at elevations of five hundred feet or more above sea level. The Kahana stream has probably the greatest low water flow, while the low flows of the Waiahole and Punaluu streams are nearly as large. The Waikane stream is much smaller, but as it lies between the Waiahole and Kahana, its comparatively small flow is of considerable importance in augmenting the flow of the three larger streams. The flood discharges of all of these streams are very high and of much more frequent occurrence than on the leeward side of the island.

The rainfall along the windward palis of these valleys is probably about twice that on the corresponding slopes on the leeward side of the Koolau range. On account of topographic and geologic conditions, however, the percentage of surface run-off to rainfall on the windward side is much greater than on the leeward side. It is estimated that at least fifty per cent. of the rainfall on the leeward side becomes ground water which supplies the various and separate artesian supplies of the leeward valleys. It is probable that formerly a much larger proportion of the rainfall on the windward side became ground water, a large part of which appeared as springs in the lower valleys and near sea level. Erosion apparently has eaten into the upper reaches of these valleys until the old porous surface strata have largely disappeared and the hard, water-impervious strata beneath have been exposed. As a result, these windward valleys have now exposed many high level springs which bring to the surface underground water courses that formerly came to the surface at lower levels, or below sea level. The result has produced a much higher low water flow from the upper reaches of these valleys than at other localities on the island.

The Waiahole Water Company's project will divert the surface flow from the Waiahole, Waianu, Waikane and Kahana valleys at an elevation of from 800 to 753 feet above sea level. From available data it is estimated that the average low water flow diverted will be about thirty million gallons per day, and that the average yearly flow will be between forty and fifty million gallons per day. The frequent flood run-off will undoubtedly amount to more than the capacity of the project, which is 125 million gallons per day.

Underground Water.

The north, or windward, portal of the main tunnel was located directly under the main springs which furnish the low flow of the Waiahole stream. It was anticipated that the tunnel would encounter the underground channels which fed these springs and the main tunnel was started about three feet below grade and was gradually worked up to the real tunnel grade, to allow the

water to drain out by gravity from the first thousand feet of the tunnel. A hydro-electric power plant operated by this water was installed in the valley below. The water encountered, instead of reaching a maximum of about ten or twelve million gallons per day as was expected, far exceeded this estimate, and as the bore progressed the amount of water increased until large syphons had to be installed to keep the water from driving out the workers. On June 26, 1914, when the north side bore had reached a point about 1700 feet from the surface the water had increased to about forty million gallons per day and the work on the north side had to be stopped on this account.

Early in November, 1914, the flow began to decrease and this decrease has continued more or less gradually until on November 20, 1915, it reached about eight million gallons daily, which is but two million gallons per day in excess of the former low water flow from the Waiahole springs. This flow measured about the same until January 26, 1916, when the last measurement was made.

In the south end of the tunnel little water was encountered until about March, 1915, when the heading was about ten thousand feet in from the portal; the maximum discharge of about fifteen million gallons was encountered about July 20th, and after that date the flow gradually decreased to about four million gallons daily about December 11.

From present indications it is evident that little inflow within the main tunnel is to be expected in addition to the flow of from six to eight million gallons daily, which formerly appeared as the Waiahole springs.

Principal Features of Project.

Main Tunnel—Length, 14,567 feet; elevation above sea level, north portal about 750 feet and south portal about 725 feet; gradient 0.2 per cent. or two in one thousand. Cross section, bottom width 7.0 feet; maximum depth of water 5.0 feet; water surface width 8.0 feet. Total depth 7.5 feet. Maximum capacity 125 million gallons daily.

North Side Tunnels—Total length 24,621 feet. Gradient and cross section the same as main tunnel.

South Side Tunnels, Ditches and Structures—Tunnels have gradient of 1.3 in 1000 and the same cross section as main tunnel. Length 19,211 feet. Open ditches, length 18,580 feet. Inverted syphons, total length, 72-inch and 78-inch diameters, about 4000 feet.

* * * * *

The work was started in January, 1913, and the water will be turned into the tunnel about May 1, 1916.

The total cost of the project is said to be about $2,300,000.

REMEDIES FOR TWO CURRENT PESTS.

By E. M. Ehrhorn, *Superintendent of Entomology.*

Cutworms Damaging Vegetables and Young Plants in the Flower Garden.

Complaint comes to the Division of Entomology of young plants and vegetables being damaged or killed by worms which are found curled up in the soil about the plants. These are cutworms, the larvae of owlet moths. Searching for the worms around the plants and killing them will naturally check their ravages. The following poison bait placed about the plants in small quantities will attract the cutworms and will readily kill them. Use the following ingredients:

Parisgreen, ½ pound,
Molasses, ¼ gallon,
Bran, 10 pounds.

Mix the parisgreen and bran dry, seeing that they are thoroughly mixed. Add the molasses and just enough water to moisten the mass. Place the mixture about the plants in small quantities, from a teaspoonful to a tablespoonful. Care must be taken to keep domestic animals, chickens or small children away from the poison.

Rose Mildew.

Many tea roses now show a white powdery or mealy substance on the young foliage. This is the powdery mildew, a very common fungus of various plants. When first noticed it can be checked by dusting the plants with dry powdered or sublime sulphur. In very bad cases where the fungus has been allowed to spread for some time, the following remedy will give good results:

Dissolve 1 oz. of copper sulphate (blue stone) in 1 pint of hot water. Dissolve 2 oz. of carbonate of soda (sal soda) in 1 pint of hot water. Mix the two solutions and let stand for a few hours, then add 1½ liquid ounces of ammonia and add enough water to make 1½ gallons of spray mixture with which to spray the plants thoroughly. Repeat the spraying again in two or three days if the plants were badly infested.

PRECINCTIVE FLORA OF THE WAIANAE MOUNTAINS, OAHU.

An Annotated Reference List of Seventy Species and Varieties.

By Vaughan MacCaughey.

The island of Oahu is made up of two mountain masses, the remnants of former gigantic volcanic domes, designated by the native names—Waianaes and Koolaus. Although now forming a single island, there is abundant evidence, both geological and biologic, to indicate that these masses at one time in the history of the Oahu region formed two distinct islands. The Waianae Range is very much older than the Koolaus, and undoubtedly existed as an island long before the Koolau dome emerged from the sea. For more extended accounts of the very interesting geologic history of the Waianaes, see Hitchcock, *Hawaii and Its Volcanoes,* and Bryan, *Evidences of the Deep Submergence of the Waianaes,* in Thrum's Annual for 1916.

As a result of these geological mutations and the topographic and climatic changes that have developed therefrom, there are many species of plants that are highly precinctive on Oahu. Of these a notable number are confined almost exclusively to certain portions of the Waianaes. The author, in connection with botanical instruction at the College of Hawaii, has had occasion to make numerous field excursions into the Waianae Range, and to take parties of college students into these mountains. The following list has been prepared for purposes of convenient reference, and has proven of value in connection with this field work. Unless otherwise noted the species are endemic:

1. *Alectryon macrococcus,* Radlk; *"Mahoe."* Soap-tree Family; Kauai to Maui; xerophytic; on Oahu only in Makaha Valley; medium tree.

2. *Alphitonia excelsa,* Reiss; *"Kauila."* Tree (medium to large). Buckthorn Family; rare; all islands; on Oahu, Waianaes only; xerophytic; species occurs throughout Australasia and Polynesia.

3. *Alsinidendron trinerve,* Mann. Pink Family; summit and western slope of Kaala only; erect undershrub; sepals greenish-red.

4. *Bobea Hookeri,* Hillebd.; *"Ahakea."* Madder Family; Oahu only, rare, Wailupe and Makaleha; tall shrub or small tree; flowers greenish-yellow.

5. *Breweria Menziesii,* Benth & Hook. Convolvulus Family; Oahu to Maui; rare; on Oahu only Kaala and Wailupe; a diffuse woody twiner; flowers greenish.

6. *Campylotheca micrantha,* Cassin. Composite Family; spe-

cies occurs Oahu to Hawaii; certain varieties peculiar to Waianaes; shrubby.

7. *Cheirodendron Gaudichaudii* (DC.) Seem; *"Olapa."* Large tree. Aralia Family; all islands; var. peculiar to Kaala and Niihau.

8. *Cheirodendron platyphyllum* (Hook & Arn.) Seem. Kauai, Kaala and Konahuanui only; stunted tree.

9. *Chrysophyllum Polynesicum,* Hillebd. *"Keahi."* Sapota Family; Oahu, Molokai, Lanai; on Oahu only Wailupe and Makaleha; small tree; xerophyte.

10. *Clermontia macrocarpa,* Gaud. var. *cymosa.* Lobelia Family; species common all islands; variety only on slopes of Kaala; tall shrub or small tree, flowers yellowish-green.

11. *Cryptocarya Mannii,* Hillebd.; *"Holio."* Shrub or tree. Laurel Family. Kauai and Waianaes only.

12. *Cyanea superba,* Gray. Lobelia Family; Oahu only, Waianaes, Niu and Wailupe; trunk 12-16 feet; flowers white or cream.

13. *Cyrtandra Lessoniana,* Gaud. Gesneria Family; Oahu only; certain varieties only in Waianaes; erect shrub; flowers white. A number of other Cyrtandras occur in the Waianaes.

14. *Delissia sinuata,* Hillebrd. Lobelia Family; Oahu and Lanai; on Oahu Makaleha only; stem 2-4 feet; flowers white.

15. *Eugenia rariflora* Benth. var. *parvifolia.* Myrtle Family; very rare; species on Oahu and Maui only; variety on Kaala only; a tall shrub.

16. *Gardenia Brighami,* Mann; *"Nau."* Madder Family; xerophytic; all islands, but rare on Oahu; Nuuanu and Makaleha Valleys only; shrub or small tree.

17. *Gouania orbicularis, Walp.* Buckthorn Family; Waianaes only; tall shrub.

18. *Gouania vitifolia,* Gray. Buckthorn Family; Waianaes only; prostrate shrub.

19. *Gouldia hirtella,* Hillebrd. Madder Family; only on Waialeale plateau and Kaala; an erect shrub; flowers purplish.

20. *Gouldia macrocarpa,* Hillebrd. Madder Family; Kauai and Kaala only; a small gnarled tree.

21. *Gouldia terminalis,* Hillebrd. Madder Family; Oahu to Hawaii; on Oahu in Waianaes; a tall rambling shrub.

22. *Gunnera petaloidea,* Gaud; *"Ape."* Haloragidaceae; all islands; Oahu, Kaala only; enormous perennial herb.

23. *Hesperomannia arborescens,* Gray. var. *Oahuensis.* Composite Family; species occurs in Koolaus; variety only in the Waianaes; a tree, 20-30 feet.

24. *Hibiscus Brackenridgei.* Gray. Mallow Family; rare. Oahu, Maui, Lanai; Makaleha; erect shrub, flowers yellow.

25. *Hillebrandia Sandwicensis,* Oliver; *"Pua maka-nui."* Begonia Family; Kauai to Maui; on Oahu, Kaala only; succulent herb, flowers showy pink.

26. *Isodendrion longifolium,* Gray. Violet Family; Kauai and Kaala only; tall shrub; flowers purple-white.

27. *Isodendrion pyrifolium,* Gray; *"Au-paka."* Violet Family; all islands; Oahu, Waianaes only. Spreading shrub; flowers greenish white.

28. *Kadua cordata.* Cham. & Schl. Madder Family; Oahu and Kauai; on Oahu only Waianaes and Niu; a spreading shrub.

29. *Kadua glomerata,* Hook and Arn. Madder Family; Kauai to Hawaii; on Oahu only in Waianaes; a rambling shrub, flowers greenish-yellow.

30. *Kadua parvula, Gray.* Madder Family; Makaha Valley only; an erect shrub; flowers white. There are several other Kaduas in the Waianaes.

31. *Lepidium arbuscula,* Hillebd. Mustard Family. Oahu only; here only on dry open ridges of the Waianaes, (Makaha). Gnarled shrub; flowers whitish.

33. *Lipochaeta tenuifolia,* Gray. Composite Family; Makaha Valley only; herbaceous perennial.

34. *Lobelia yuccoides,* Hillebd. Lobelia Family; Kauai and Oahu, 2000-3000 feet; on Oahu only in Waianaes; trunk simple, 4-6 feet high.

35. *Mezoneurum Kauaiense,* (Mann). Legume Family; all islands; on Oahu, Waianaes and Wailupe.

36. *Morinda trimera,* Hillebrd. *"Noni kua-hiwi."* Madder Family; on Oahu and Maui; on Oahu, Mt. Pua-kea only; a small tree, very rare.

37. *Neraudia melastomaefolia,* Gaud. *"Oloa."* Nettle Family; species on all islands, xerophytic; several varieties only in Waianaes; a low shrub.

38. *Nothocestrum latifolium,* Gray. *"Aiea."* Potato Family; Kauai to Maui; on Oahu only in arid Waianaes; a small tree; xerophyte; flowers greenish-yellow.

39. *Nototrichium Sandwicense,* Hillebd. *"Kului."* Shrub or tree. Amaranth Family; xerophyte; all islands.

40. *Pelea elliptica,* Hillebrd. Small tree. Rue Family; Oahu, Maui and Molokai; on Oahu, Waianaes and Niu only.

41. *Pelea pallida,* Hillebrd. Small tree. Rue Family; Kaala only.

42. *Phyllostegia mollis,* Benth. Mint Family; Oahu to Maui; on Oahu in Waianaes only; suberect herb; flowers pinkish white.

43. *Pittosporum cauliflorum,* Mann. *"Hoawa."* Shrub. Pittosporum Family. Waianaes only.

44. *Platydesma companulata,* Mann. var. *pallida.* Small tree. Rue Family; Kaala and Maui only.

45. *Pseudomorus Brunoniana* (Eudl.). Bureau; *"Ai-ai."* Tree. Mulberry Family; Waianaes and Wailupe; all islands; not endemic.

46. *Pteralyxia macrocarpa* (Bod.) K. Sch. *"Kaulu."* Small

tree. Dogbane Family; Oahu only, Nuuanu and Makaleha Valleys; fruits bright red; rare.

47. *Pterotropia Kauaiensis,* Hillebd. Aralia Family; Kauai and Oahu; on Oahu, Kaala and western Koolaus only; tall tree.

48. *Ranunculus Mauiensis,* Gray. *"Makou."* Buttercup Family; all islands; on Oahu on Kaala only. Herbaceous perennial, spreading; flowers yellow.

49. *Rollandia calycina,* G. Don. Lobelia Family; Oahu only, Kaala and Waiolani; trunk simple, 4-6 feet high; flowers dark purple. Several other Rollandias occur in the Waianaes.

50. *Rumex albescens,* Hillebd. Polygonum Family; Kauai and Oahu; Kaala; low decumbent herbs.

51. *Sapindus Oahuensis,* Hillebrd. *"Aulu."* Soap tree Family; Kauai and Oahu only, Waianaes, very rare in Koolaus (Niu); medium tree.

52. *Scaevola Chamissoniana,* Gaud. Goodenia Family; species Kauai to Hawaii; certain varieties only in Waianaes; small shrub; flowers white, purple-streaked.

53. *Schiedea Hookeri,* Gray. Pink Family; Waianaes only, Makaha and Makaleha; weak, decumbent herb.

54. *Schiedea Kaalae,* Wawra. Pink Family; Kaala only; woody shrub.

55. *Schiedea ligustrina,* Cham. & Schl. Pink Family; Waianaes only; small erect shrub.

56. *Schiedea Nuttallii,* Hook. Pink Family; all islands; on Oahu, Kaala and Niu; spreading shrub; sepals green.

57. *Schiedea pubescens,* Hillebd. Pink Family; Oahu, Molokai, and Maui; on Oahu, Kaala only. Shrubby, spreading; sepals purple.

58. *Sicyos microcarpus,* Mann. Cucumber Family; Kauai and Oahu; on Oahu only in Waianaes; weak prostrate or climbing herb.

59. *Sicyos pachycarpus,* Hook & Arn. Cucumber Family; Kauai and Oahu; Diamond Head, Honolulu, and the Waianaes; a climbing or prostrate herb.

60. *Sideroxylou spathulatum,* Hillbd. Var. *densiflorum.* Sapota Family; species occurs on Maui and Lanai, variety only on Kaala; small tree; flowers rusty-tomentose.

61. *Silene anglica* L. English Catchfly. Pink Family; Kauai and Kaala; a small annual weed naturalized from Europe; occurs in nearly all warm temperate regions.

Sponia—see Trema.

62. *Stenogyne Kaalae,* Wawra. Mint Family; Waianaes only; prostrate, shrubby; flowers purple-red.

63. *Tetramolopium tenerrimum,* Nees. Composite Family; Oahu, Makaha Valley; low decumbent shrub; rays white, disk purple.

64. *Tetraplasandra Kaalae* (Hillebrd.) Harms. Aralia Family; recorded only from top of Kaala, 4000 feet; a small tree.

65. *Tetraplasandra meiandra* (Hillebrd). Harms. Aralia Family; Oahu and Hawaii; certain varieties only in the Waianaes; a small tree.

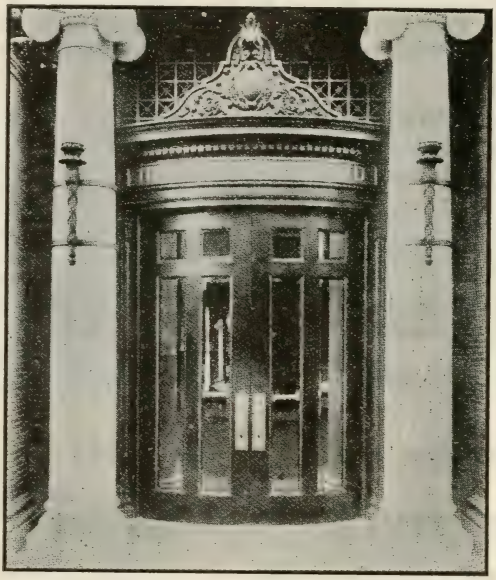
66. *Trema amboinensis,* Blume. Tree. Elm Family; northern slopes of Kaala; Manoa, Molokai. Rare; no native name. No other localities in these islands; not endemic.

67. *Urera Kaalae,* Wawra. *Opuhe.* Nettle Family. Shrub. Mt. Pua-kea, Waianaes. No other record.

68. *Vigna Oahuensis,* Vogel. Legume Family; Oahu and Kauai; on Oahu, Waianaes only; twining herb; flowers yellow.

69. *Viola helioscopis,* Hillebrd. Violet Family; Waianaes only; Makaha. Shrub; large snow-white waxy flowers.

70. *Zanthoxylum Mauiense,* Mann. var. Small tree. Rue Family; species occurs on Oahu, Maui, Molokai, Lanai; var. only from Kaala.



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G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

APRIL, 1916

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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, APRIL, 1916. NO. 4

A total of 15,885 koa and kukui trees have been planted during the last two years on the hills back of the Makiki springs in the Honolulu Watershed Forest Reserve. These now cover an area of 32 acres of gulch and ridge land and have begun to make a noticeable showing.

The system employed on the Kukaiau Ranch, Hawaii, of raising eucalyptus seedlings in nursery beds in the ground, instead of in boxes, and of planting them out direct from these seed beds, has been successful and is a good example of economical planting where conditions are favorable.

The heavy rainfall during January raised considerably the water levels in the artesian wells of Honolulu, and all reservoirs on Oahu were filled to overflowing. The Superintendent of Hydrography estimates that the flood run-off on January 18 at an elevation of 400 feet above sea level in the Honolulu basin exceeded 1,000,000,000 gallons per day and that at sea level this was probably three times greater.

During the epidemic of sore head in a coop of homing pigeons, reported by the Territorial Veterinarian, only the younger squabs were attacked. The older birds, apparently by instinct, would have nothing to do with their young.

The Board of Commissioners of Agriculture and Forestry hopes to receive frank comments from all hog raisers on the proposed new rule and regulation concerning the handling of hog cholera and other diseases of swine before the same is promulgated.

A consignment of vegetable seed from the U. S. Department of Agriculture has recently been received through the courtesy of our Delegate in Congress by the Division of Forestry, and is available for free distribution as long as it lasts.

Notice has been received that Mr. D. O. Lively, the recent commissioner general for the live stock exhibit of the Panama-Pacific Exposition in San Francisco, has opened offices in San Francisco for the purpose of buying and selling livestock on com-

mission. In his letter to the Territorial Veterinarian he says: "If any of your friends in the Islands should express a desire for pure-bred horses, cattle, sheep or swine, please refer them to me. I make my commission off of the seller in all instances, unless I receive an order to go somewhere and look up animals. In that event the buyer pays the commission." Mr. Lively's address is Room 216, Hobart Building, San Francisco, California, and his recent position as head of the great live stock exhibit of the San Francisco Fair is sufficient guarantee of his integrity and ability to warrant this recommendation of an enterprise which undoubtedly will fill a long-felt want.

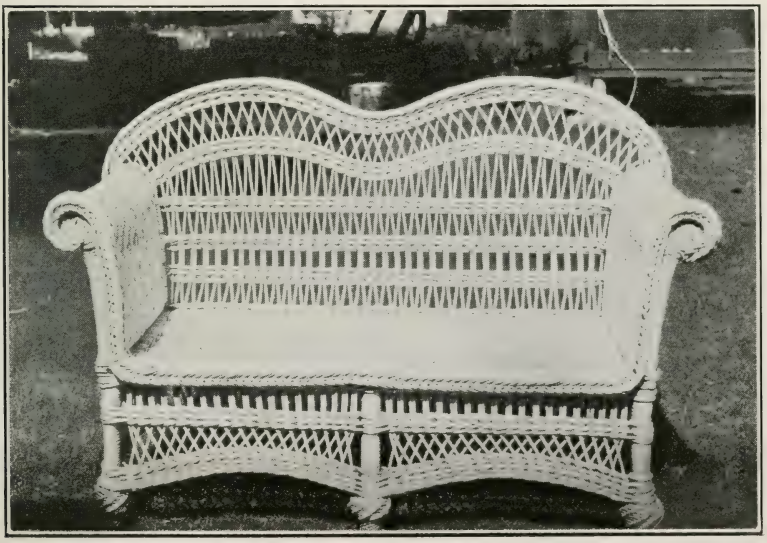
Forester New Features

With an improved cover design and an unusual number of illustrations, printed on special paper, this number of the Forester takes a step forward. The intention is to have the improvement continued until the standard of the publication will be raised to a par with the handsomest local magazines. Its appearance now vies with that of the best tropical agriculture organs anywhere, and in future no effort will be spared to make the contents as attractive to the mind as the mechanical effect is to the eye.

New Domestic Industry Indicated

Wicker furniture made in Hawaii has been exhibited in Honolulu within the past few months, indicating the possibility of a new industry for this Territory. It was manufactured from willow rods grown at the Makiki experiment garden of the Board of Agriculture and Forestry. The particular species is the yellow willow, *Salix vitellina,* and it was brought to Honolulu in 1909 by Dr. L. R. Gaspar from his old home in Funchal, Madeira. Joe Rosa, a Portuguese laborer for the Board, was the artisan, who came to these islands eight years ago from Madeira, where he used to make wicker furniture and baskets.

Some specimens of the furniture were placed on exhibition for



a few days in a furniture store by the Board, and later the editor of the Forester was invited to view several pieces at Gonsalves & Co.'s store, where they were offered for sale. Mr. Gonsalves said that he used to import the same kind of furniture from the Azores many years ago. Besides its capabilities of artistic design, of which the pieces seen bore good evidence, the furniture is substantial and readily cleanable. A settee of this wickerwork is shown in the accompanying illustration.

To anyone inclined to grow this willow for the making of wicker articles, the Board of Agriculture and Forestry will be glad to furnish cuttings.

Division of Forestry

Honolulu, Hawaii, February 12, 1916.

Board of Commissioners of Agriculture and Forestry.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of January, 1916:

FOREST FENCING.

As authorized by the Board at the January 6 meeting, I advertised for bids for the fencing of Section A of the Olaa Forest Park Reserve, Hawaii, and on January 29 opened the two bids which were received. One amounted to $732.80, and the other to $2193.75. Owing to the great difference between these two amounts, I surmised that the lowest bidder had not well enough acquainted himself with the conditions on the ground, which, on account of the presence of lava rock, will make the cost of post-hole digging quite expensive. I called this matter to his attention, and he submitted a new bid in the sum of $1025. Believing that the public interest would be subserved thereby, and in fairness to the other bidder, I rejected both bids and have readvertised a call for bids to be opened in this office on February 28.

AWA PERMIT.

The permit of Mr. C. M. Hudson for gathering two tons of awa in the Puna Forest Reserve, Hawaii, was on January 7 extended so that he has until March 1, 1916, to gather this material. This extension was authorized at the Board meeting of January 6.

HAWAII TRIP.

From January 19 to 25 I was on a trip to the Island of Hawaii and spent a large part of the time acquainting myself with the government land of Piha, in the Hilo Forest Reserve, preliminary to submitting my final recommendations as to what should be done with this land. The Kukaiau Ranch has been engaged in taking the cattle out of the upper part of this land, and approximately 130 head have already been removed. There are said to be about 100 more head in the forest reserve farther makai. These are, however, being taken out as rapidly as they can be caught. Owing to the erroneous maps of this region and indefinite location of some of the government land boundaries in this part of the Hilo reserve, I have requested the government surveyor to have the essential lines rerun, and he has promised to send up a surveyor during February for this purpose. The resulting map will, undoubtedly, show the correct boundary lines

and the location of all fences in this region. I wish to use this map in presenting my final report to the Board as to what should be done with Piha.

On this trip, in company with Manager D. S. Macalister of the Kukaiau Ranch, who kindly furnished me with accommodations, I also inspected the plantations of blue gum trees in this region required by clauses in the general leases of government land to this ranch, and found that the work was up to date and the condition of the trees very good. The method of raising seedlings in the ground for direct planting is very successful in this locality.

I also picked out an excellent site for a ranger station and nursery on the land of Humuula, in the northwest corner of the Hilo Forest Reserve, at an elevation of about 5000 feet. A forest ranger will soon be needed in this region to keep the government fences in repair, and to keep stock out of the forest reserves. He undoubtedly would also have time to conduct a forest tree nursery, in which timber trees from the temperate zone of commercial value could be grown for planting on the slopes of Mauna Kea. Since the money for this purpose is available, and there will soon be need for a forest ranger for administrative duties in this region, I shall shortly submit for your approval a detailed plan for this project.

While in Hilo I consulted with Mr. David Forbes concerning the proposed new forest reserve along the Volcano Road on the lower part of the land of Waiakea. He is favorable to the project, and has promised to assist me in the selection of a man whom I shall recommend for appointment as forest ranger to take care of the fences which the Board is building around the reserves along the Volcano Road, to prevent trespass on these reserves, and to plant native and introduced trees which will be an ornament and which will make this scenic road a greater attraction to the traveling public.

MANOA RANGER STATION.

During the month I have consulted with the Land Commissioner concerning a piece of government land in Manoa Valley, of 17 acres, called Kahoiwai, which I am desirous of obtaining as a forest ranger station. I have visited the land several times and have found it very suitable, not only as a ranger station for the ranger in charge of Nuuanu, Manoa and Palolo valleys, but also as a suitable place where additional experiments in the growing of introduced trees can be carried on. At present there is pending in the Land Office an application for a right-of-way across part of the land. After this has been disposed of I shall present the matter to the Board, with a recommendation that the area be created a forest reserve.

EUCALYPTUS PLANTATION IN NUUANU.

On the last day of January, with the assistance of the two seed boys, I began taking a series of measurements on the eighteen different species of new eucalyptus trees planted in Nuuanu with federal funds by my predecessor in 1911. The trees are now old enough to begin to show up their relative rates of growth, and the results of these measurements will undoubtedly furnish very interesting comparisons.

Respectfully submitted,
C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, February 12, 1916.

The Superintendent of Forestry, Board of Agriculture and Forestry, Honolulu, Hawaii.

DEAR SIR:—I herewith submit a report of the principal work done during the month of January, 1916.

Nursery.—Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	...	140	140
Gratis	550	3633	4183
	550	3773	4323

Collections.

Collections on account of plants sold amounted to	$ 1.25
Rent of building, nursery grounds, for December, 1915	35.00
	$36.25

Plantation Companies and Other Corporations.

The distribution of plants under this heading for the month amounted to 19,000 in seed boxes and 1100 in transplant boxes. Total, 20,100.

Congressional Vegetable and Flower Seed.

A fresh consignment of flower and vegetable seed has been received from Washington consisting of the following:

V-3—1988 packages containing in each, corn, lettuce, onion, radish and squash.

V-5—1962 packages containing in each, carrot, lettuce, musk melon, onion and tomato.

200 packages of assorted flower seed were also received.

Makiki Station.

The principal work done at the Makiki Station consisted of transplanting and potting plants, mixing and sterilizing soil and other routine work. The heavy rains have done some damage to the newly-transplanted trees, but they will recover again providing the good weather sets in soon.

Honolulu Watershed Planting.

Trees planted during the month amounted to 1292 koa. The total number of trees planted to date on Sugar Loaf and Hering Valley section of the Honolulu watershed amounts to 8420 koa and 7465 kukui; total, 15,885. A commencement has been made to clear the lower end of Hering Valley. A great deal of good land in this valley is being encroached upon by a very bad pest, the name of which is *Caesalpinia bonduc*. Fortunately this pest has not had time to spread over a large area, but where it has got a hold it takes complete possession of the land and makes it impossible for one to go through it without getting clothes and skin torn to pieces by its spines, which resemble fish hooks.

Advice and Assistance.

The writer has been requested to make calls and otherwise give advice and assistance as follows: Calls made to places in and around the city, 12; persons asking for advice by telephone, 10; persons calling at the nursery for advice, 14; persons applying by letter for advice, 8. Total, 44.

Very respectfully,

David Haughs,
Forest Nurseryman.

Division of Entomology

Honolulu, Hawaii, February 7, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit my report of the work performed by the Division of Entomology for the month of January, 1916, as follows:

During the month there arrived at the port of Honolulu 41 vessels, of which 25 brought vegetable matter and one sailing vessel brought sand from Midway Island.

Disposal.	Lots.	Parcels.
Passed as free from pests	859	20,372
Fumigated	10	10
Burned	52	52
Returned	5	5
Total inspected	926	20,439

Of these shipments, 20,117 arrived as freight, 169 packages by mail and 153 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 61,615 bags of rice and 2696 bags of beans arrived from Japanese and Chinese ports, all of which after a very careful examination was found free from pests and was passed.

Pests Intercepted.

Two thousand seven hundred and ninety-three pieces of baggage from foreign ports were examined during the month, mostly at the immigration station, and 49 lots of fruit were confiscated and destroyed. One package of algaroba seeds from Manila was swarming with *Psocids* and was fumigated before it was delivered.

One camellia plant from Japan was infested with the chaff scale (*Parlatoria pergandei*) and was destroyed. In the soil around a package of plants from San Francisco were found a few *Chryomelids*; leaf eaters (*Gastroidea cyanea*) probably had hatched from pupae in the soil. All soil was removed from the plants and burned.

A pear tree in the baggage of a Japanese immigrant was infested with scale and destroyed by burning. One package of citrus seeds from Japan and one package of ginseng roots from

Korea were returned as unmailable by the postoffice authorities. Two lots of fruit and one pine tree were sent back on board of the steamer, as the same were contraband coming from Japan.

Beneficial Insects.

During the month of January the following parasites of fruit flies have been bred:

Tetrastichus giffardii	9,600
Diachasma fullawayi	326
Diachasma tryoni	300
Total bred	10,226

Including the usual number of parasites of the horn, house and stable fly, as well as the usual emergence of *Opius humiles* from gathered fruits at the Insectary, the following parasites were liberated in various sections:

Tetrastichus giffardii	6,500
Diachasma fullawayi	289
Diachasma tryoni	253
African spalangia	1,300
Philippine spalangia	1,200
African hornfly parasite	1,200
Philippine Pteromalid	1,300
Galesus silvestrii	50
Dirhinus giffardii	50
Total parasites liberated during the month	12,142

The reason that we are able to liberate more *Tetrastichus giffardii* than other fruit fly parasites is on account of getting from 30 to 40 of these from one fruit fly pupae. This explanation seems necessary, as some people do not seem to understand why we rear so many of the first-named species.

On January 14 Mr. Curtis P. Clauson, Assistant of the California State Insectary, brought two large boxes with parasites of the citrus mealy bug. These arrived in very good condition, and as soon as the weather conditions permit, large numbers will be liberated in various sections. This parasite is an enemy of the citrus mealy bug. Fortunately this species of mealy bug has not given much trouble in these Islands, and, although present, never becomes very abundant, but thinking that the parasite might attack other species of mealy bugs, especially the one attacking the alligator pear tree, we sent our request for some colonies to the California institution. The species has now been observed for several months, and has attacked the large sugar cane mealy

bug and the pineapple mealy bug. During January only 188 of these parasites were liberated, as the weather was very unfavorable.

HILO INSPECTION.

Brother M. Newell reports the arrival of seven steamers and two sailing vessels, six steamers bringing vegetable matter, the sailing vessels bringing lumber. The fruit and vegetable shipments consisted of 197 lots and 3307 packages, all of which were found free from pests and were allowed to land.

INTER-ISLAND INSPECTION.

Fifty-eight steamers plying between the port of Honolulu and ports on the other islands were inspected during the month. The following shipments were passed:

Taro	508	bags
Plants	82	packages
Vegetables	51	packages
Total passed	641	packages

The following packages were refused shipment on account of infestation and soil:

Plants	6	packages
Fruit	4	packages
Total refused shipment	10	packages

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

Division of Animal Industry

Honolulu, Hawaii, February 15, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I beg to report on the work of the Division of Animal Industry for the month of January, 1916, as follows:

PROPOSED NEW RULE AND REGULATION.

I beg to submit herewith copy of a new rule and regulation pertaining to the control and suppression of outbreaks of hog cholera and other swine diseases within the Territory of Hawaii. If the same meets with the approval of the Board, and receives the Governor's signature, it will undoubtedly be of material assistance to the veterinary officials in dealing with such outbreaks.

SORE HEAD IN CHICKENS.

Since publicity was given to the new treatment for this disease through the official bulletin of this Board, a considerable number of applications have been received from both Hawaii and this island for information and assistance in dealing with such outbreaks. It has, therefore, become necessary to prepare a circular containing instructions as to the treatment as well as the preparation of vaccine for the prevention of this disease.

A number of outbreaks have been attended to in Honolulu and vicinity, from which it has been learned that the disease attacks not alone chickens, but also turkeys and pigeons, in most cases selecting the younger birds for its victims. Though it is too early to make any definite statement, it would, however, seem that the disease, while practically identical in these three classes of domestic birds, is rarely, if ever, transmitted from one class to another. In one chicken yard, for instance, the young turkeys alone are affected, while in a flying coop with homing pigeons only the squabs were affected, although young turkeys were kept in the same enclosure. For this reason it would seem doubtful whether vaccine prepared from the lesions of turkeys would be effective if injected in either chickens or pigeons, and vice versa. In fact, our observations so far seem to demonstrate that to get the best results the vaccine must be prepared from the individual flock which is to be treated.

While good success has been met with in nearly every case up to this time, it has been reported by Dr. Elliot that the disease has appeared among a flock of young chickens which were injected with vaccine prepared from material obtained from another flock. If similar outbreaks should occur it would seem that fresh vaccine

must be prepared for each individual outbreak, or, in other words, that a severe outbreak yielding a good deal of material (scabs) cannot be taken advantage of for the protective inoculation of other flocks, nor for the treatment of birds of a different class or variety. It has been learned during the present month that carbolic acid may be added to the vaccine as a preservative without injury to the treated birds, but whether the effectiveness of the vaccine is diminished by this addition of carbolic acid, it would seem almost impossible to ascertain. As now prepared, the vaccine deteriorates rapidly through putrefaction, unless kept directly on ice. But even though this treatment of vaccination may seem to have several objectionable features connected with it, the results have, nevertheless, been so satisfactory in most cases as to warrant its use wherever poultry is raised and when the disease makes its appearance.

I would, therefore, recommend that the circular of instructions herewith appended be reprinted in 250 copies and that the same be distributed among the poultry raisers of the Islands.

HOG CHOLERA.

No outbreak of this disease has occurred during the past month. The anti-hog cholera serum, of which the Board keeps a supply on hand against sudden outbreaks, can now be obtained for 1.5 cents per c.c., or perhaps a little less.

BOVINE TUBERCULOSIS CONTROL WORK.

The 1916 test has now been started, and will be carried through as soon as possible, as it is intended to test all dairy herds twice this year. A considerable number of pure-bred Holstein cattle have arrived here recently, and although the unfavorable weather of the past two months caused a decided fall in the milk production, it may now be said to have returned to the normal. The muddy condition of most paddocks caused several complaints about dirt in the milk, and it is hoped that the milk producers will take the same to heart, as any kind of sediment in a bottle of milk is inexcusable, and may be the cause of much sickness among the children of the community.

LIVE STOCK FROM NEW ZEALAND.

Two importations of Merino rams, each consisting of 25 head, arrived here during the month. They were exceptionally fine animals and will no doubt put their stamp on the flocks of the Parker Ranch, for which place they were imported.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT TERRITORIAL VETERINARIAN.

Honolulu, Hawaii, February 3, 1916.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry,

Board of Agriculture and Forestry, Honolulu, Hawaii.

SIR:—I beg to submit the following report for the month of January, 1916:

Tuberculosis Control.

The seventh annual test of the dairy and ranch herds in the City and County of Honolulu commenced with the testing of the Swanzy Ranch at Kualoa. A total of 469 head were injected intradermally, out of which number 461 were passed as free from disease and 8 condemned and branded. This is a far better showing than was expected, considering the large number of reactors on the previous test and that the two tests were a full year apart. If the above results can be taken as any criterion, the present year will see a remarkable decrease in the percentage of tuberculous animals among the dairy and ranch herds on this island.

Importation of Livestock.

S. S. Matsonia, San Francisco—11 cts. poultry.

S. S. Niagara, Sydney—1 dog, C. G. Hume.

S. S. Lurline, San Francisco—21 cts. poultry, 1 horse, J. E. Jaeger; 1 ct. pigeons, 1 ct. rabbits, Wells Fargo Ex.

S. S. Wilhelmina, San Francisco—17 cts. poultry, 1 dog, H. Hester.

S. S. Manoa, San Francisco—46 cts. poultry.

S. S. Niagara, Vancouver—2 dogs (Airedales), F. M. Swanzy.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, February 12, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—The following report of operations of the Division of Hydrography during January, 1916, is submitted:

WEATHER CONDITIONS.

The rainfall for the month was very heavy, and a heavy "Kona" storm which lasted from the 16th to the 19th caused much damage and a loss of 14 lives in the Iao Valley, on Maui. The rainfall in Honolulu exceeded all available records (1877 to date) for intensity and total quantity for any month. At the Nuuanu Pali the rainfall for the month was 31.2 inches, while between the 18th at 8:45 a. m. and the 19th at 5:25 p. m., a total of 33 hours, the rainfall amounted to 8.6 inches. In the upper Iao Valley the rainfall was about 30 inches on the 17th, 18th and 19th, and it is probable that at least half of this fell within 24 hours.

The large upper reservoir in Nuuanu Valley was filled to a point beyond all previous records, and on the last day of the month was approximately three-fourths full. All other reservoirs on Oahu were filled to overflowing.

The underground water supply also received an immense increase. The water level in the wells in the city, which were being pumped, rose, at some places, about three and one-half feet, while in the Pearl Harbor basin, where little pumping was done, the underground water level rose as much as six feet. The outflow from the north portal of the Waiahole tunnel also increased about a million gallons per day.

FLOODS.

The heavy rainfall resulted in the heaviest floods ever recorded by this office on nearly all of the Oahu and Maui streams.

In the immediate vicinity of Honolulu, the Manoa stream at an elevation of 325 feet above sea level, in the upper Manoa Valley reached a maximum rate of flow of 282 million gallons per day on two days—the 8th and 18th.

On the Nuuanu stream at a point below the spillway of Reservoir No. 2, the flow exceeded 210 million gallons per day on the 18th.

The flood flow of the Kalihi stream at an elevation of about 500 feet above sea level reached 296 million gallons per day on January 25. The recording instrument on this stream was out

of order and no record was obtained on the 18th. Undoubtedly the discharge exceeded 400 million gallons daily. No records were taken on the Palolo, Makiki, or Pauoa streams. It is estimated, however, that the total flood run-off on the 18th at an elevation of 400 feet above sea level in the Honolulu "basin" (between Fort Shafter and Diamond Head) exceeded 1,000,000,000 gallons per day. At sea level the run-off was probably three times this amount.

Correspondingly heavy flood occurred on all Oahu and Maui streams, the Iao stream, on Maui, being the most remarkable instance. It is roughly estimated that the Iao stream, with a drainage area of but about three and one-half square miles, discharged on the 18th, at an elevation of about 800 feet above sea level, about 1,500,000,000 gallons.

STORM DAMAGE.

It is estimated that it will cost this Division about $1,000.00 to replace property lost and structures destroyed, and to put trails back into passable condition.

On Maui the Iao stream continuous record station, which was about 15 feet above low water flow, entirely disappeared. The cable, cable car iron frame, turnbuckle and padlock were recovered. The Stevens instrument went with the shelter. The storm so eroded the valley and changed the stream channel that a good location cannot be found for a new station, and no attempt will be made in the near future to re-establish this station. The continuous record stream measurement stations on the Hanawi and West Wailuaiki streams were damaged by having the instrument shelters destroyed. The instruments were saved and will be repaired and replaced in the near future. Many staff gages and several foot bridges were swept away, and many miles of upper valley trails were completely blocked. The cross-section of the Olowalu stream at the site selected for the new proposed station was so changed that it was abandoned. As no other suitable location for this station can be found on this stream, it has been decided to abandon this project and use the instrument purchased for it on a continuous record station on the Lahainaluna stream.

On Kauai and Oahu the damage was limited to the loss of a few staff gages and the blocking of trails.

COÖPERATION.

A conference with private water users of Maui was held at Paia and Wailuku from the 11th to the 14th, at which the question of the measurement of water diverted from East Maui government lands under the various water licenses, was discussed. Tentative arrangements were made under which the entire time

of one of the employes of this division will be devoted to this work at the expense of the water users. It is probable that this special work will be started in April.

SPECIAL INVESTIGATION.

An investigation of the water being diverted by private companies from government lands in Kohala, Hawaii, was completed. A copy of the report of this investigation is appended hereto.

CONSTRUCTION WORK.

Materials and equipment for the two new proposed continuous record stations on the government-owned streams of Olowalu and Ukumehame were assembled, and excavation work was practically completed on the Olowalu stream when the storm of the 18th proved the station site undesirable. Under orders from this office this work was discontinued until an investigation could be made in February by the Superintendent. The balance of the month was devoted to completing repair work to existing stations on East Maui.

OPERATION AND MAINTENANCE WORK.

Kauai. On account of bad weather conditions, no construction or repair work was undertaken. The greater part of the month was used to assemble, check and prepare for publication data for the biennial report.

Thirty-three stream and ditch-measurement stations and 15 rain-measurement stations were visited, and 33 stream and ditch measurements were made.

Oahu. Only routine work was done. Twenty-nine stream and ditch-measurement and four rain-measurement stations were visited. Eighteen stream and ditch measurements were made at regular stations, and 12 miscellaneous measurements were made.

Kauai. A large amount of repair and maintenance work was done. Structures were painted, trails cleared, deadmen and other foot bridge and cable anchorages uncovered and examined. Fifty-seven visits were made to regular stream and ditch-measurement stations, and two visits were made to the upper Iao rain gage. Twelve stream measurements were made.

Hawaii. In addition to the special investigation made by Mr. Austin, nine stream measurements were made at two stream-measurement stations in the Waipio Valley, of which daily gage height records have been furnished by coöperating parties for several years.

ANNUAL RAINFALL RECORDS.

These are being sent in so slowly by coöperating parties that the annual results cannot be estimated at this time.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

Preliminary List of Plants Growing in Mrs. Mary E. Foster's Grounds, Nuuanu Avenue, Honolulu

By Joseph F. Rock, Consulting Botanist.

The following preliminary enumeration of plants growing under cultivation in Mrs. Mary E. Foster's grounds on Nuuanu Avenue, Honolulu, is by no means complete. There are still a great many trees on the grounds which, owing to their being neither in flower nor in fruit, cannot be identified at present. The same holds good for a number of palms. Some of the plants omitted could be enumerated by their generic name only, but these have been reserved for a later date, when it is hoped that the writer will be enabled to publish an additional list completing the enumeration.

The residential grounds occupied by Mrs. Foster belonged originally to the late Dr. William Hillebrand, a resident physician of Honolulu for twenty years and an ardent botanist, well known in the botanical world through his excellent "Flora of the Hawaiian Islands." It was due to his enthusiasm that Honolulu has at present so many beautiful and rare flowering trees, for a great many plants which are now very common were introduced by him in the early days. His grounds on Nuuanu Avenue are a veritable jungle full of beautiful palms and rare flowering trees and shrubs gathered from all parts of the world at great expense, and many of which have as yet not been planted elsewhere in the Territory.

Of great interest are the palms, and special mention may be made of *Arenga wightii* (plate 4), a relative of the sugar palm. It is stoloniferous, sending out young plants from an underground creeping rhizome. *Corypha umbraculifera*, the Taliput palm of the Singhalese (plate 2), is also represented. It is the largest leaved of the fan palms, the leaves having a diameter of 13 feet. It flowers the last year of its life, producing a great abundance of seeds. Another remarkable palm is the *Oreodoxa oleracea*, the cabbage palm, of which there is one very tall specimen on the grounds over 100 feet in height.

Of the genus *Ficus*, six or seven species are to be found. Specimens have been collected and, with others found elsewhere in the Territory, have been sent on to Mr. Merrill in the Philippines, who has consented to determine them for us.

Filices.

Cibotium chamissoi Kaulf. Hapu. Hawaii.



PLATE 1. Group of palms in Mrs. Foster's residence. *Cocothrinax argentea*, *Dictiosperma album*, *Phoenix dactylifera*, *Arenga saccharifera* and *Attalea cohune*.



PLATE 2. *Corypha umbraculifera*. Taliput palm.

Cycadaceae.

Cycas circinalis L. Sago palm. Tropical Asia; Japan.
Cycas revoluta Thunb.

Coniferae.

Podocarpus neriifolia D. Don. Gunsi. Himalaya.
Araucaria bidwillii Hook. Bunya Bunya pine. Queensland.
Araucaria cookii R. Br. Cook pine. New Caledonia.
Agathis australis Salisb. Kauri pine. New Zealand.

Gramineae.

Arundo donax L. Reed grass. Southern Europe; Trop. Asia.
Saccharum officinarum L. Sugar cane. Tropics.

Palmae.

Corypha umbraculifera L. Talipot palm. India.
Cocothrinax argentea Lodd. Silver thatch palm. West Indies.
Livistona chinensis R. Br. Chinese fan palm. China.
Latania loddigesii Mart. Mauritius palm. Mauritius.
Caryota urens Linn. Wine palm. India.
Hyophorbe amaricaulis Mart. Bottle palm. Mauritius.
Phoenix reclinata Jacq. Cape of Good Hope.
Phoenix dactylifera L. Date palm. N. Africa.
Oreodoxa oleracea Mart. Cabbage palm. West Indies.
Oreodoxa regia H. B. K. Royal palm. Tropical America.
Arenga wightii Griff. Deccan India.
Arenga saccharifera (Wurmb.) Labill. Sugar palm. India to Malaya.
Howea Belmoriana Becc. Lord Howe Isl.
Attalea cohune Mart. Cohunenut palm. Honduras.
Elaeis guineensis Jacq. Oil palm. Tropical Africa.
Dictiosperma album (Bory) W. et Dr. Mascarene Islands.
Areca catechu L. Betel-nut palm. India to Malaya.
Cocos nucifera L. Coconut. Tropics.
Cocos plumosa Hort. Kew. Feather palm. Brazil.
Hyophorbe verschaffeltii Wendl. Mauritius.

Araceae.

Monstera deliciosa Liebm. Ceriman. Tropical America.
Scindapsus aurea (Lindl. et André) Engler. Solomon Islands.

Musaceae.

Strelitzia reginae Banks. Bird of Paradise flower. S. Africa.
Ravenala madagascariensis Sonn. Traveler's tree. Madagascar.

Liliaceae.

Sanseviera zeylanica (L) Willd. Bowstring hemp. Tropical Africa.

Cordyline terminalis (L.) Kunth. Ti or Ki. India; Polynesia.
Yucca gloriosa L. America.

ZINGIBERACEAE.

Alpinia nutans Rosc. Shell-flower. India.

MORACEAE.

Artocarpus communis Forst. Breadfruit. Polynesia.
Ficus religiosa Linn. Peepul. India.
Ficus elastica Roxb. India rubber tree. South Asia.
Ficus heterophylla Linn. Creeping fig. India; Ceylon.

MALVACEAE.

Hibiscus schizopetalus Hook f. Coral hibiscus. Tropical Africa.
Hibiscus mutabilis L. Rose-Mallow. China.
Hibiscus rosa-sinensis L. Chinese hibiscus. Southeast Asia.
Hibiscus tiliaceus L. Hau. Tropics.
Hibiscus elatus Sw. Mountain mahoe. West Indies.
Malvaviscus arboreus Cav. Tropical America.

BOMBACEAE.

Ceiba pentandra (L.) Gaertn. Silk cotton tree; Kapoe. Tropical America.
Ochroma lagopus Sw. Corkwood. West Indies.

STERCULIACEAE.

Sterculia acerifolia A. Cunn. Flame tree. N. S. Wales.
Theobroma cacao L. Cacao. Tropical America.

ANONACEAE.

Artabotrys uncinatus (Lam.) Merr. Ilang-ilang. India; Ceylon.
Anona muricata L. Sour sop. Tropical America.

MALPIGHIACEAE.

Galphimia glauca Cav. Tropical America.

MAGNOLIACEAE.

Magnolia grandiflora L. Magnolia. America.
Michelia champaca L. Champaca. India; Malay.

COMBRETACEAE.

Terminalia catappa L. Kamani. India; Malay.

TILIACEAE.

Berrya amonilla Roxb. Petwun. India; Ceylon.

BIXACEAE.

Bixa orellana L. Arnott or Anatto. Tropical America.



PLATE 3. The two tall trunks on right are *Oreodoxa oleracea*—Cabbage palm. The palm on the left is *Oreodoxa regia*—Royal palm.



PLATE 4. *Arenga wightii*, a stoloniferous palm, relative of the Sugar palm.

FLACOURTIACEAE.

Flacourtia jangomas (Lour.) Mig. South Asia.
Flacourtia sepiaria Roxb. India to Malaya.

RHAMNACEAE.

Zizyphus jujuba Mill. Jujube tree. Tropical Asia.

RUTACEAE.

Murraya exotica L. Mock orange. Tropical Asia; Australia; Polynesia.

ANACARDIACEAE.

Spondias lutea L. Golden apple. Tropics.
Spondias dulcis Forst. Wi apple. Tropics.
Semecarpus anacardium Linn. Marking-nut tree. Tropical Asia; Australia.

PASSIFLOTACEAE.

Passiflora laurifolia L. Waterlemon. Tropical America.
Passiflora quadrangularis L. Granadilla. Tropical America.

LECYTHIDACEAE.

Barringtonia asiatica (L.) Kurz. Barringtonia. Tropics.
Barringtonia racemosa (L.) Blume. Kumia. India; Ceylon; Malaya; Polynesia.

GUTTIFERAE.

Mammea americana L. Mamme-apple. Tropical America.
Calophyllum inophyllum L. Kamani. India; Polynesia.
Garcinia xanthochymos Hook. f. African mangosteen. Tropical Asia.

BIGNONIACEAE.

Bignonia tweediana Lindl. Brazil.
Bignonia jasminoides Thunb. Brazil.
Kigelia africana (Lam.) Benth. Sausage tree. Trop. Africa.
Spathodea campanulata Beauv. Tropical Africa.
Crescentia cujute L. Calabash tree. Tropical America.

VERBENACEAE.

Tectona grandis Linn. Teak. Burma.
Duranta repens L. Tropical America.

ACANTHACEAE.

Graptophyllum pictum (L.) Griff. Morado. Polynesia.

LYTHRACEAE.

Lagerstroemia speciosa (L.) Pers. Crepe myrtle. India; Malay; Australia.
Lawsonia inermis L. Henna. Africa and India.

OLEACEAE.

Olea europaea L. Olive. Europe; Africa.

PUNICACEAE.

Punica granatum L. Pomegranate. Eastern Subtropical Asia.

BORRAGINACEAE.

Cordia subcordata Lam. Kou. Tropics.

ROSACEAE.

Eriobotrya japonica Lindl. Loquat. China; Japan.

LOGANIACEAE.

Strychnos nux-vomica Linn. Strychnine tree. India; Malaya.

MYRTACEAE.

Eugenia uniflora L. Tropical America.
Eugenia jambos L. Rose-apple. India.
Eugenia brasiliensis Lam. Grumixameira. Brazil.
Psidium guayava L. Guava. Mexico.

MYRISTICACEAE.

Myristica fragrans Houtt. Nutmeg. Moluccas.

MELIACEAE.

Melia Azedarach Linn. Pride of India. Sub-Himalaya; China.
Melia Azadirachta Linn. The Neem (Nim) tree. India.

ARALIACEAE.

Brassaia actinophylla Emtl. Australia.
Nothopanax fruticosum (L.) Mig. Papua. Malaya; Polynesia.
Nothopanax guilfoylei (Coqu. et Marché) Merr. Polynesia.

HERNANDIACEAE.

Hernandia peltata Meissn. Jack-in-the-box. Tropics.

LEGUMINOSAE.

Clitorea ternatea L. Tropics.
Delonix regia (Boj.) Raf. Royal Poinciana. Madagascar.
Peltophorum inerme (Roxb.) Naves. Yellow Poinciana. Ceylon; Malaya; Australia.

Pongamia mitis (L.) Nerr. Balic-balic. Tropics.
Prosopis juliflora DC. Algaroba. South U. S. A.; Mexico.
Inocarpus edulis Forst. Ivi. Tahitian chestnut. Polynesia.
Enterolobium cyclocarpum Gr. Jamaica.
Castanospermum australe A. Cunn. Moreton Bay chestnut. Australia.
Saraca indica Linn. Sorrowless tree. Malaya.
Adenanthera pavonina L. Bead tree. India.
Tamarindus indica L. Tamarind. Tropical Africa.
Acacia Koa Gray. Koa. Hawaiian Islands.
Acacia farnesiana (L.) Willd. Klu. Tropical America.
Pithecolobium dulce (Roxb.) Benth. Inga dulcis. Tropical America.
Sesbania grandiflora Poir. India.
Cassia siamea Lam. India; Malaya.
Cassia fistula L. Golden shower. Upper Egypt; India.
Albizzia saponaria (Lour.) Bl. Philippines; Malaya.
Albizzia Lebbek (L.) Benth. Siris tree. Tropical Africa; Asia.

MORINGACEAE.

Moringa oleifera Lam. Horse-radish tree. India.

RUBIACEAE.

Ixora coccinea L. India.
Ixora macrothyrsa Cf. Malaya.
Rondoletia speciosa Lodd. Cuba; Mexico.
Coffea arabica L. Coffee. Southwestern Asia.

APOCYNACEAE.

Thevetia neriifolia Juss. Cabalonga. Tropical America.
Allamanda Hendersonii Bull. Tropical America.
Plumiera acutifolia Poir. Temple flower. Tropical America.
Vinca rosea L. Madagascar periwinkle. Tropical America.
Trachelospermum jasminoides Lem. Star jasmine. China.
Nerium oleander L. Oleander. Europe; Asia.

SAPOTACEAE.

Chrysophyllum cainito L. Star-apple. West Indies.
Achras sapota L. Chico; Sapodilla. West Indies; Cen. America

ASCLEPIADACEAE.

Hoya carnosa R. Br. Wax plant. South China.
Cryptostegia grandiflora (Roxb.) R. Br. Tropical Africa.

EUPHORBIACEAE.

Phyllanthus nivosus Bull. Snow bush. Pacific Islands.
Acalypha wilkesiana Muell. Arg. Fiji Islands.
Codiaeum variegatum (L.) Blume. Croton. Moluccas.

Euphorbia splendens Boj. Crown of thorns. Madagascar.
Euphorbia pulcherrima Willd. Poinsettia. Tropical America.
Aleurites moluccana (L.) Willd. Kukui nut. Malaya; Polynesia.

LAURACEAE.

Persea americana Mill. Avocado. Tropical America.
Cinamomum zeylanicum (L.) Bl. Cinnamon. Ceylon; India.
Cinamomum camphora (L.) Nees. Camphor tree. China; Formosa.

AMARANTHACEAE.

Alternanthera versicolor Regel. Brazil.

PROTEACEAE.

Macadamia ternifolia F. v. Muell. Queensland nut. Australia.

SOLANACEAE.

Solandra grandiflora Sw. Tropical America.

Douglas Fir in Hawaii

By C. S. Judd, Superintendent of Forestry.

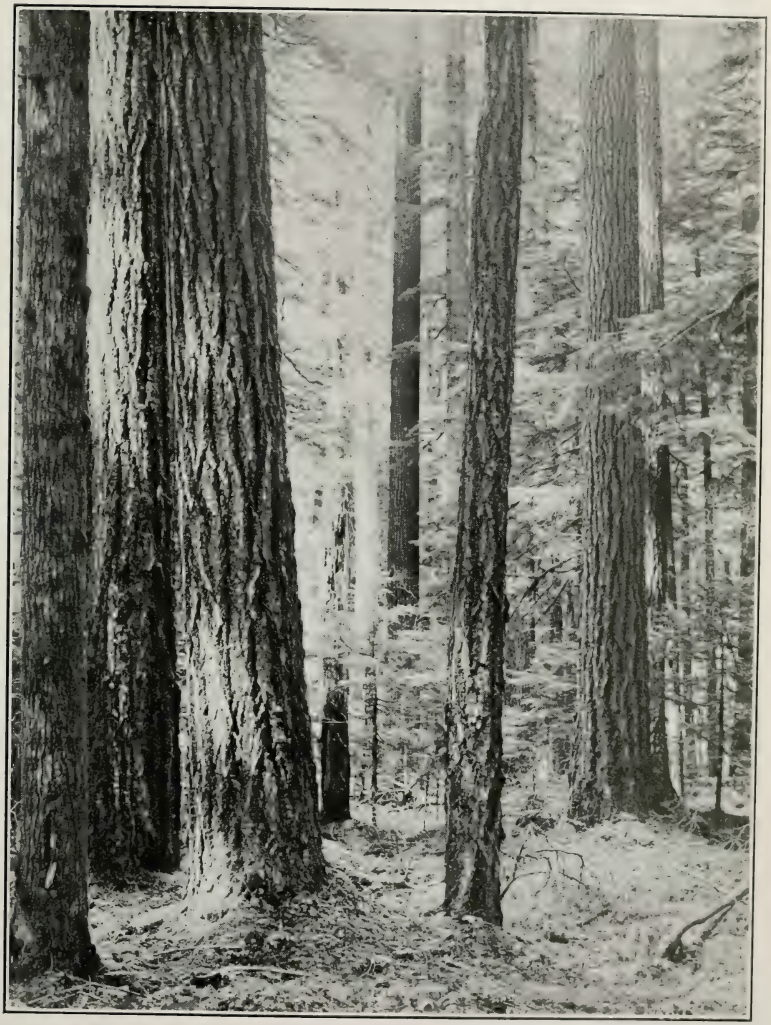
We, in Hawaii, live in houses built mostly of Douglas fir lumber, and over 85 per cent of the $1,525,418 worth of wood imported into the Territory during the last fiscal year and used for almost every conceivable purpose, was of this species, but we do not know it by this name. To most of us, it is known as Nor'-west, or Oregon pine. Although we have long been accustomed to this name, there is no longer reason for this appellation and, as I shall point out later, there is a very good reason why we should call it Douglas fir, the accepted name by which it is now known in all the lumber markets on the mainland.

The tree is not a pine at all, but stands in a distinct class by itself with one allied species. As the botanical, generic name, which, by the way, is a barbarous combination of a Greek with a Japanese word—*Pseudotsuga*—denotes, it is a "false hemlock," and the specific name—*taxifolia*—signifies that it has leaves like the yew tree, from which Robin Hood used to make his bows. Botanically, the tree is radically different from a pine in that it does not have needles and very different from the true firs in that the cones, instead of being erect and falling to pieces on the tree, are pendant like those of the spruce and fall entire from the tree, and in that the leaves, instead of being broad and usually indented on the ends, are narrow and sharp.

No other important American tree is more widely distributed or grows under a greater range of climatic conditions than does Douglas fir, for it is found throughout the Pacific Coast region and the Rocky Mountains from British Columbia to Northwestern Texas, Mexico, and the mountains of California. With the exception of the giant sequoias, no other tree on the mainland attains larger size. The tallest Douglas fir on record has a height of 380 feet, and single trees of this species have measured 15 feet in diameter and contain enough lumber to build two good-sized houses.

The average yield of Douglas fir on the Northwest coast is from 35,000 to 60,000 board feet per acre, and more than one-half of the timber at present standing in western Washington and Oregon and southwestern British Columbia is Douglas fir. It takes a Douglas fir tree about 75 years to grow to the most profitable merchantable size, and the usual annual cut of approximately five and one-half billion board feet gives this species second rank in the amount of timber cut annually in the United States.

Douglas fir is the strongest wood for its weight of any wood found in the United States, and because of the immense size of the timber a Douglas fir log will produce a very high percentage



Douglas Fir in the Cascade National Forest, Oregon.

of perfect timber, free from knots and other defects common to species of smaller growth.

Douglas fir was first discovered in 1791, on Nootka Sound, Alaska, by Archibald Menzies, who was with Vancouver on his voyage of discovery. The first description was published in the journal of the Lewis and Clark expedition, but from the very beginning botanists disputed over the classification of the tree, calling it first a pine and then a fir, but finally decided that it belongs to the hitherto unknown genus of *Pseudotsuga*. During this discussion the botanical name of *Pseudotsuga Douglassii* was for a time given to the tree in honor of David Douglas, a Scotch botanist and explorer who obtained seed in the State of Washington, long before it passed under the American flag, and sent it back to Scotland in 1827. Here the tree has proven to be the fastest-growing conifer imported into England and, next to the larch, the most valuable. On the European continent, and particularly in Northern Germany, where it has been extensively planted, it is considered the most valuable of all introduced trees for woodland crops.

Now, soon after he had in this manner first made known this tree to the European world, David Douglas became acquainted with these islands, for on his third botanical trip to America his ship touched at Honolulu early in 1830 on the way to the Columbia River. Writing to a friend in Scotland soon after, he said:

"I was delighted with the people and with the kind treatment I received, especially from those individuals who had formed part of his late Majesty Riho Riho's suite when he visited Britain."

During his further explorations in the region of the Columbia River he interspersed another visit to these islands, coming from Monterey, California, in August, 1832, but, as he writes, "At the Sandwich Islands a violent rheumatic fever prevented me from venturing at all to the hills, during my short stay, and I sat and fretted enough about it."

On his third and last trip to these islands, where he met his melancholy and untimely fate, David Douglas arrived at Honolulu on December 23, 1833, and proceeded at once to gratify his ambition to scale the lofty mountains of Hawaii as well as to collect materials for a flora of these islands which, in his own words, "offer rewards to the naturalist, over all others." For six months he was energetically engaged in these labors, and was the first to measure with any degree of accuracy the height of Mauna Kea and of Mauna Loa. Concerning his ascent of Mauna Loa he wrote from Hilo on February 7, 1834, to a lady resident of Honolulu:

"Suffice it to say that I reached the culminant point after immense labor, fatigue, anxiety, and some degree of danger. The cold was intense. You may pledge my name for saying that the Great Crater is on the very summit of Mauna Loa, at present in

an active state. One day there, madam, is worth one year of common existence. This is twenty-seven miles round and 1274 feet deep. I rested from 12 M. to 12 at night, on the mountain, when the wane moon presented herself in silvery brightness, reflecting a glare on the ragged lava like Gothic turrets. With thankfulness and joy, the beautiful constellation of Orion being my guide, I rose to descend to a climate more congenial to my nature, and the habitations of men, the land of flowers, and the melody of birds."

While on his way from Kohala to Hilo on July 12, 1834, at a place near Keanakolu, in North Hilo, David Douglas fell into a pit excavated for capturing cattle and was gored to death by a bullock which was already entrapped. He was found soon after and his body taken to Hilo, where it was held for examination for marks of other violence, because of the suspicious circumstances of his death. He was finally buried by the English consul in the yard of Kawaiahao Church on August 4, 1834. By 1856 the grave of David Douglas, although originally bricked over, had become so obliterated that it could not be identified. Consequently the tombstone in his memory, which was prepared in San Francisco by the Rev. S. Brenchley, was placed on the outside wall of the church to the right of the entrance, where it may be seen to this day.

Cannot we, of these islands, pay a tribute to the memory of this lamented traveler whose name is identified with the progress of discovery in the various departments of natural science in N. W. America, California, and the Hawaiian group, who thrice visited our shores, which became the final resting place of his mortal coil, by calling this wood, indispensable to our comfort and convenience, by its proper name—Douglas fir?

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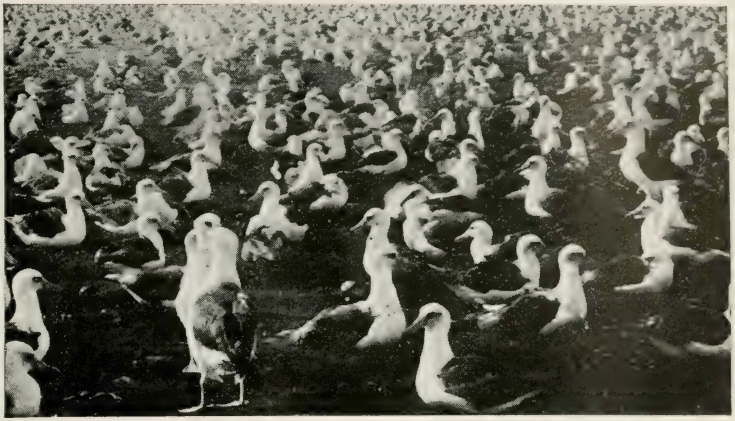
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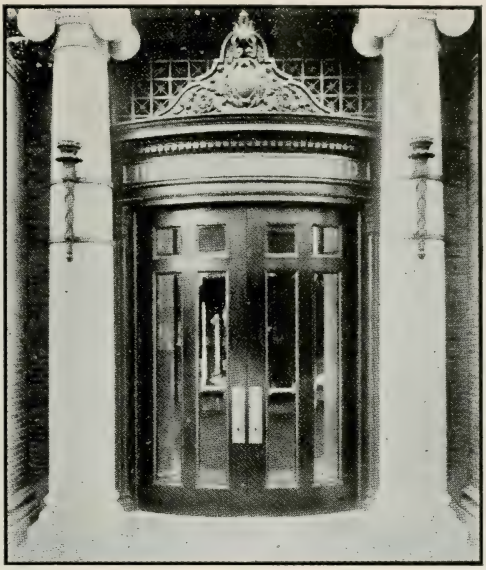
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THE HAWAIIAN FORESTER AND AGRICULTURIST

MAY, 1916

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Attention is called to the article in this number by Territorial Veterinarian Nörgaard on the treatment of chickens and other poultry for sorehead, and the offer of assistance to poultry raisers. This treatment has already been tried in the Territory with successful results, and it is hoped that it will be universally adopted, and that poultry raising will thereby receive an impetus. Extra reprints of this article may be obtained on application to the Board.

Proposed New Forest Reserve

The Governor has given notice of a hearing at 2 p. m., April 24, 1916, at the Government Nursery, King street, Honolulu, at which time and place evidence and arguments either for or against the setting apart of an unleased government remnant of land in Manoa Valley, Oahu, called Kahoiwai, as a forest reserve, to be called the "Manoa Ranger Station" will be considered.

The land recommended for this purpose by the Superintendent of Forestry, and approved by the Board, consists of 15.36 acres and is a narrow strip running from near the Manoa stream up to the top of a steep hill. The lower part of the land is somewhat swampy and the cultivation of bananas on it has been attempted without any great success because of the coldness of the soil. The upper portion is covered with a splendid grove of koa and other native forest trees, which are well worth protecting.

The steep, open land on this proposed new reserve affords a suitable place for the experimental planting of many introduced trees which the Division of Forestry has on hand, but which have not as yet been set out as a forest community. Because of its central location in Manoa Valley, the land also affords an excellent site for the headquarters of the Forest Ranger, who is posted in the valley to watch out for forest and grass fires, and prevent trespass on the government lands in the Honolulu Watershed Forest Reserve.

Shipments of honey to the States last year amounted to more than $40,000, a moderate increase over each of the two previous years.

Meat and dairy products imported from the mainland last year were valued at $1,286,823, or about $175,000 more than in 1914, but nearly $88,000 less than in 1913.

Hawaii's imports of vegetables from the mainland amount to from $350,000 to $500,000 a year. No doubt much of this could be saved by the development of home production.

New Rules and Regulations for the Division of Forestry

The new rules and regulations for the Division of Forestry have recently been passed by the Board and approved by the Governor. These appear on the By Authority page of the present issue of the FORESTER.

Rule II covers the protection and administration of forest reserves in general. While the law gives the Board full power to make rules and regulations for the protection and administration of forest reserves, no rule, excepting Rule I which concerns grass cutting in the Honolulu Watershed Forest Reserve and is only of local application, had been passed by the Board so that in the administration of forest reserves in the past the Division of Forestry had practically been without authority from a definite rule and regulation. Rule II was, therefore, prepared by the Superintendent of Forestry after a careful study of the necessary points to be covered in the administration and protection of government lands in the Territorial forest reserves. Many of the provisions of this rule have been taken from the regulations of the United States Forest Service, which have been tried out for many years on the 150 million acres of National Forest land all over the United States, and have proved satisfactory.

The object of Rule II is to prevent acts which are detrimental to the property of the Territory and to the health of the community, and none of its provisions will be found hard to comply with by any public-spirited citizen.

Rule III is of local interest and concerns the purity of that part of Honolulu's water supply which comes from upper Nuuanu Valley in the Honolulu Watershed Forest Reserve. In itself, this rule will not insure the absolute purity of the water in the reservoirs, because a filtration plant and keeping road drainage from the reservoirs are also necessary for this desired end. The enforcement of this rule will, however, be a great help in removing the danger of water pollution by human beings and wandering animals who in the past have not kept off the areas draining into the upper three Nuuanu reservoirs, in spite of the "keep off" signs which have been placed there in the past. Since the area concerned is a part of the Honolulu Watershed Forest Reserve, and therefore under the control of the Board of Agriculture and Forestry, it is only logical that this Board should take this step in the effort to insure pure water.

The area on which trespassing by the general public is forbidden by the rule, has been confined to the smallest possible limits, and includes only the lands which drain into the upper three reservoirs and the intake just above the Luakaha falls.

To be sure, this rule will eliminate some of the favorite routes of trampers in our mountains who may feel that they have been unjustly deprived of visitations to their accustomed haunts. On the other hand, they should consider the health of the community above their own personal pleasure and recreational delight, and if they have the proper public spirit they should be eager to coöperate with the Division of Forestry in preventing any violation of this rule.

This rule has been published in Japanese, Chinese, Hawaiian and Portuguese, as well as in the English papers of Honolulu, since it is applicable to all alike and it has the full force and effect of law. This rule, as well as Rule II, which has also been approved by the Governor and published, is a preventive measure in which all law-abiding residents should be interested and should desire to coöperate in observing.

Agricultural implements imported to Hawaii from the mainland last year were valued at $48,306, which was about $28,500 more than in 1914, but only $5,000 more than in the year before.

Breadstuffs and animal feed other than hay, etc., were imported from the mainland last year to the value of $2,542,001, which is about $210,000 gain over 1914, but $90,000 odd decline from 1913.

Hawaii imported from the States last year live stock, including fowls, to the value of $194,400. While this was $90,000 more than the previous year's, it was about $163,600 less than 1913 imports.

According to a statement by the Portland office of the federal forest service, the various field parties in Oregon and Washington last field season covered 88,000 acres, mapping the topography on a scale of four inches to the mile, and estimating the timber by taking an actual tally of ten per cent of the trees.

Champion milch cows are recorded by the Ayrshire Breeders' Association, with headquarters at Brandon, Vt., as follows: "The senior four-year-old, August Lassie, 29581, A. R. 1429, bred and owned by L. A. Reymann Estate, Wheeling, West Va., has just closed her year of official testing, with a record of 17,784 lbs. milk, 720.03 lbs. fat, 840 lbs. butter, 4.05 per cent fat, which places her the world's champion in her class. The junior two-year-old, Willowmoor Etta 3d, 35833, A. R. 1691, bred and owned by J. W. Clise, Redmond, Washington, has just closed her year of official testing, with a record of 16,621 lbs. milk, 666.06 lbs. fat, 784 lbs. butter, 4.01 per cent fat, which places her the world's champion junior two-year-old."

Mail Importations of Plants and Seeds From Foreign Countries

By E. M. Ehrhorn, *Superintendent of Entomology.*

For the information of the public it is necessary again to call attention to the rules and regulations of the Federal Horticultural Board of the U. S. Department of Agriculture, concerning the sending of plants and seeds into the United States through the mails from foreign countries.

An order issued as far back as December 16, 1913, by the Second Assistant Postmaster General, prohibits the importation into the United States from foreign countries through the mails, of all plants and plant products for propagation, including seeds, except field, vegetable and flower seeds. This prohibition, therefore, applies to bulbs, roots and tubers, and to all seeds of trees, palms, shrubs or other plants. It excepts only field, vegetable and flower seeds, including rice, alfalfa, sorghum, panicum and other field seeds; lettuce, cabbage, radish, onion and other vegetable seeds; and pansy, sweetpea, carnation and other flower seeds, which may be imported from foreign countries by mail.

Cotton seed, which would be rated as a field seed, is, however, forbidden entry into the United States from *any* foreign country, except from certain states in Mexico, either by mail or any other carrier; nor can cotton seed be sent from Hawaii into any part or even through the United States.

Therefore, under the order issued by the Second Assistant Postmaster General, all nursery stock and other plant products, including orchids and tree seeds, except as noted, which are received in the mails from foreign countries, will be returned by the postmaster at Honolulu, as prohibited, to the country and place of origin.

This order, therefore, restricts the carriage of such products from foreign countries to other means of conveyance, such as by express or freight.

Importations by these methods pass through the Customs' office in the normal way, and are under complete control by them and the plant quarantine service.

The reason for this order should be apparent to all. The possibility of transmitting many injurious insects and plant diseases in packages of plants and seeds sent through the mails has been proved, and the thorough inspection of such mail matter is almost an impossibility, unless the department is furnished with an army of men, which is out of the question. On the other hand, consignments of seed and other plant products sent by express or freight are more readily examined by the inspector, hence the exception to this rule.

Division of Forestry

Honolulu, Hawaii, March 18, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of February, 1916:

Forest Fencing.

The work of forest protection by constructing new fences and repairing existing barriers to stock along the forest boundaries continues to be one of the chief activities of this Division. During February, the new fence along 2.73 miles of the boundaries of the Kealia and Moloaa Forest Reserve, Kauai, which Forest Ranger Lovell has been constructing for the past few months with the assistance of a few laborers, was completed at a cost of approximately $375 per mile. This new fence closes up a gap which has existed on the boundaries of the reserves in this region and will afford complete protection to the government forest lands of Anahola and Aliomanu, parts of which were formerly overrun with cattle.

The heavy wind storm in January blew over several trees in the koa grove reserve at 29 miles on the Volcano Road, Hawaii, which damaged the woven wire fence which had recently been constructed around this reserve. During the month this damage was repaired by the contractor who built the original fence.

In coöperation with the ranch department of the O. R. & L. Co., work has begun during the month on necessary repairs to the boundary fences on both sides of the Pupukea Forest Reserve, Oahu, where the wire had rusted out and some of the posts needed resetting. This Division furnished 28 coils of wire and 1 keg of staples for the work.

Other fencing work to be begun shortly will be the construction of 5.61 miles of new fence around Section A of the Olaa Forest Park Reserve on the Volcano Road, Hawaii, and necessary repairs to the Lualualei Forest Reserve foundary fence, on Oahu.

Forest Reserve Monuments.

In order to familiarize the public with the boundaries of forest reserves, I have undertaken to erect the standard forest reserve monuments which this Division has on hand at conspicuous places on forest reserve boundaries. One of these was placed in Nuuanu

Valley on the right hand side of the road as one goes toward the Pali just mauka of where the new road turns off from the old. Another was placed on the boundary line in the bottom of Pauoa Valley. In locating the latter it was found that a Japanese, one Sora Sakido, had about a year ago moved his house from low land on the Booth Estate, a parcel of which he rents for the purpose of raising violets, to higher land and, not knowing the boundaries, had inadvertently built a part of it on a few square feet of government land at the very corner of the reserve. The Japanese, who makes a scanty living from his violets, gets no return from the use of these few square feet of government land but, in order to legitimize his occupancy, I propose to issue him a temporary permit for the use of this land, to be renewed quarterly subject to his compliance with our rules, and require him to pay rental at the rate of $3.00 per year.

Protection of Nuuanu Reservoir Region.

During the month I have studied the subject of how better protection could be afforded to the land draining into the three upper reservoirs in Nuuanu Valley, which are within the Honolulu Watershed Forest Reserve, and more particularly with respect to how trespassers may be kept out. This is an essential step concomitant with the desirability of the establishing of a filtration plant and preventing road seepage from draining into the reservoirs. Visits were made to the land with representatives of the Board of Health and of the Survey Office and I have prepared and am submitting to you, with a special report, for approval, a new rule creating a tabu on a part of this Forest Reserve.

Inspection of Planting.

On February 16, the Forest Nurseryman and I inspected the experimental planting of 500 Ironwood trees done for this Division by Mr. Mark Robinson on one of the water reserves in the Pupukea Forest Reserve, Oahu, and found the trees to be growing in a satisfactory manner. On our way back, an inspection of the lemon gum and swamp mahogany trees planted by Manager A. A. Wilson around the Wahiawa reservoir disclosed the success which he has obtained from his initial plantings.

In this connection you may be interested to know that the returns of trees planted during the calendar year 1915 are now in and show a total of 862,364. Of this number 83 per cent were planted by sugar plantation companies.

Introduced Trees.

Mr. J. F. Rock, the Consulting Botanist of the Board, has identified and prepared a list of 145 of the trees and other plants growing in the grounds of Mrs. Mary E. Foster on Nuuanu Avenue, most of which were introduced by Dr. William Hillebrand from all parts of the world and include many beautiful and rare flowering trees not as yet planted elsewhere in the Territory. Mr. Rock's article with four illustrations will appear in the April issue of THE HAWAIIAN FORESTER AND AGRICULTURIST."

Visit of Mr. A. F. Fischer.

During the month it was my pleasure to receive a visit from Mr. A. F. Fischer, Assistant Director of the Bureau of Forestry in the Philippine Islands, who was on his way back to Manila from San Francisco, where he had been in charge of the excellent Philippine forestry exhibit at the exposition. From Mr. Fischer, with whom I compared notes on forest conditions in our respective countries, I obtained a good deal of useful information and arranged with him for exchanges which will be valuable to both archipelagos.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, March 16, 1916.

Superintendent of Forestry,
Board of Agriculture and Forestry,
Honolulu.

Dear Sir:—I herewith submit a report of the principal work done during the month of February, 1916:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold		50	122	172
Gratis	4000	150	314	4464
	4000	200	436	4636

Collections.

Collections on account of plants sold amounted to $14.75.

Collection and Exchange of Seed.

The two boys have been kept busy collecting seed in and around the city. The seeding season for most of the flowering trees and some of the forest trees is just coming in. Consequently we will be busy for some time to come in getting up as large a collection of fresh seed as possible.

We have received from the Royal Botanic Gardens, Sibpur, near Calcutta, a package containing four species of Ficus, three of which as far as I am aware, are new to the Islands. From the Royal Botanic Gardens, Peradeniya, we received two packages of grass seed, and from the Forest Department, Nairobi, British East Africa, a list of plants and seed available for exchange with a request that our list of seed be forwarded to them. Our list will be forwarded in a few days.

Plantation Companies and Other Corporations.

Under this heading the following trees were distributed: 5500 in seed boxes, 4700 in transplant boxes and 402 pot grown. Total, 10,602.

Makiki Station.

The work at this station has been directed towards the increasing of our stock and doing other routine work.

Honolulu Watershed Planting.

The work done during the month consisted of rooting out the spiny shrub (*Caesalpinia bonduc*) in the lower end of Hering Valley, also hoeing and clearing away weeds from the trees recently planted.

Advice and Assistance.

The writer has made visits and otherwise given advice and assistance at the request of people in and around the city, as follows:

Visits	10
Advice by telephone	15
Advice by letter	6
Advice given to people calling	14
Total	45

Respectfully submitted,

David Haughs,
Forest Nurseryman.

Division of Entomology

Honolulu, Hawaii, March 13, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of February, 1916, as follows:

During the month there arrived at the Port of Honolulu 34 vessels, of which 22 brought vegetable matter. One vessel arrived from the Canal Zone.

Disposal	*Lots*	*Parcels*
Passed as free from pests	905	15,693
Fumigated	7	73
Destroyed	53	55
Returned	2	2
Total inspected	967	15,823

Of these shipments 15,537 arrived as freight, 164 packages as mail matter and 122 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 11,472 bags of rice and 1904 bags of beans arrived from Oriental ports, also 2 bags of corn, all of which were carefully inspected and passed as free from pests.

Pests Intercepted.

Approximately 1913 pieces of baggage from foreign ports were examined during the month and 50 lots of fruit were found and destroyed by burning.

One case of Orchids from Balboa, Panama, was fumigated on account of a slight infestation of scale (*Aspidiotus cyanophylli*) and a nest of ants.

Another package of plants from the same place was also fumigated and some hibiscus cuttings infested with *Diaspis pentagona* were burned.

Two small orange trees and a package of citrus seeds found in baggage from Japan were seized and destroyed, no citrus stock or seed being permitted to enter the United States from a foreign

port under a ruling of the Federal Horticultural Board, Washington, D. C.

Two packages of corn from Guam were fumigated with carbon-bisulphide before delivery.

One package of beans from Italy was found in the mail and being infested with the pea weevil (*Bruchus pisorum*) was fumigated with carbon-bisulphide before delivery.

One package of tree seeds from India consigned to J. F. Rock, collaborator of the U. S. Department of Agriculture, was fumigated as a precautionary measure before delivery.

One Yew tree, in baggage from Japan, was fumigated and is held in quarantine pending further investigation. We have also two flowering cherry trees which have been treated in the same manner.

A package of Pongee silkworm cocoons arrived by mail from Japan and were turned over to us by the consignee. They have been reared to the adult stage and these have been killed and kept for the museum and collection.

Two packages of tree seeds from foreign countries were returned to original sender by the post office authorities.

Two lots of beneficial insects arrived addressed to the superintendent who turned them over to the Hawaiian Sugar Planters' Association after going over the material carefully with Mr. O. H. Swezey. All soil and packing in these shipments is destroyed by burning.

Beneficial Insects.

During the month of February the following parasites of Fruit-flies have been bred:

Tetrastichus giffardii	9250
Diachasma fullawayi	231
Diachasma tryoni	177
Total bred	9658

The following parasites, including those reared for Horn, House and Stable flies, were liberated during the month:

Tetrastichus giffardii	6000
Diachasma fullawayi	209
Diachasma tryoni	164
Galesus silvestrii	250
Dirhinus giffardii	150
African spalangia	300
Philippine spalangia	300
African hornfly parasite	500
Total parasites liberated	7873

From the material we received from the California State Insectary containing parasites of the Mealybug, we were very successful in rearing a large quantity of parasites (*Paraleptomastix abnormis*). Some of these have been placed in breeding cages for further multiplication and we were able to liberate 1522 in various places where the Citrus mealy bug was found. It is unfortunate that this species will not attack the Alligator pear mealy bug (*Pseudococcus nipae*) as this is the worst species we have in the Islands. Many of our Ladybugs have reduced other species so that we rarely have complaint of their damage. They also make inroads on the species attacking the Alligator pear and other plants, but not to a great extent. As the new parasite is more inclined to attack the citrus mealybug and as this pest is not very abundant on account of Ladybug attack, it will be difficult to say whether or not we shall be successful in establishing it here. We have also other Hymenopterous parasites attacking Mealybugs so that we are perhaps well protected on certain species but we should try to get a specific parasite for the species attacking the Alligator pear, Fig, Guava and many other plants as the damage done to new growth and blossoms by this species is very serious.

Some very encouraging letters have been received from Mr. D. T. Fullaway, who is now at Manila, where he is breeding up an *Opius* species parasitic on the Melon fly (*Bactrocera cucurbitae*). He seems very much encouraged by the results he has obtained there and hopes soon to be able to return here with a good supply for propagation.

We are now planting some Momordica charantia, a Chinese gourd, as well as Cucumber seeds at intervals, so as to have plenty of infested material ready for him when he arrives.

Owing to the scarcity of fruit, we have been breeding the various fruit fly parasites on a limited scale only. In fact our main endeavor is to keep alive all the species which have been introduced including the species for Horn, House and Stable fly until such time when we can be satisfied that they are well established in the field. As it is now we have taken all except two species in the field and these two species, *Galesus silvestrii* and *Dirhinus giffardii*, have been distributed by thousands under the most favorable circumstances and yet we have not recovered either species from material collected in the open. Our recovery of the small species, *Tetrastichus giffardii*, from material collected in the field is encouraging, although not as yet sufficient to say definitely that the species is established, but of the other species our findings give us some hope that they are fairly well established.

Hilo Inspection.

Brother M. Newell reports the arrival of seven steamers, six of which brought vegetable matter consisting of 154 lots and 3248 packages, all of which was found free from pests and diseases. During the month the "Kiyo Maru" arrived direct from Japan, bringing 3460 bags of rice and 151 bags of beans, which, after a thorough inspection, was found free from infestation and was passed.

Inter-Island Inspection.

Fifty-eight steamers plying between the port of Honolulu and ports on the other islands were attended to during the month. The following shipments were passed:

Taro	545 bags
Plants	50 packages
Vegetables	74 packages
Total passed	669 packages

The following packages were refused shipment as they did not pass the regulations pertaining to soil and infestation:

Plants	4 packages
Fruits	14 packages
Total refused shipment	17 packages

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

That it pays to raise good stock is illustrated by the experience of two Utah ranchmen who sent their steers to the same market on the same day. Both ran their stock on national forest range under grazing permits, both used the same amount of range per head of stock, and both paid the same grazing fee. One gave close attention to the selection of his breeding cows and used only high-grade bulls. The other made no effort to improve his herd. The owner of the high-grade stock received $40 per head more for his steers than the owner of the common stock. On some of the national forest ranges the stockmen club together, it is reported, and buy high-grade bulls which are owned as community property.

Division of Animal Industry

Honolulu, Hawaii, March 28, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I have the honor to submit herewith my report for the Division of Animal Industry for the month of February, 1916:

Quarantine Station.

The prolonged period of inclement weather during the latter part of last year and the beginning of this put the Animal Quarantine Station on the Beach Road to a severe test. The heavy downpour at times flooded nearly all the paddocks for large animals and only the concrete construction in the dog kennels saved these from inundation. When the rains subsided it was found that extensive cave-ins had taken place in nearly all the paddocks, due undoubtedly to subterranean outlets for the surface water that filters to them through the sand. As these cave-ins and sunken areas had to be filled in, arrangements were made with a local contractor to deliver and apply the necessary filling —clean sand—in return for accumulated manure, on an equitable basis. In this manner nearly two hundred small loads of sand (the softened condition of the ground allowed of only one cubic yard of sand to the load) have been exchanged for about 125 loads of manure and surface scrapings, and the Station put in first class condition without cost to the Board.

A number of the large algaroba trees were lost during the February storm, but these have now been replaced by fast growing shade trees supplied by the Division of Forestry. Only one of the smallest kennels was damaged by the fallen trees besides which the entire station needs repainting. This will be attended to as soon as the weather permits, there being on hand a considerable supply of shingle stain as well as the crude oil required for the posts.

In spite of the unfavorable conditions above described the general health of the quarantined animals has been excellent. The dog kennels have been nearly full throughout the winter months and it must be considered very fortunate that no epidemic made its appearance. Twice it was found that distemper was about to break out but in both cases the disease was checked and only one dog was lost, an English bull which arrived here with running eyes. This animal, in spite of every effort, became almost totally blind and finally died from the nervous form of distemper.

Only one other dog, a valuable Boston bull terrier, died from heart failure. This animal had been in excellent health up to a few minutes before death. The keeper of the station was at the time distributing the evening meal and all the dogs were, as usual, more or less excited. The dog in question was also dancing around and barking when suddenly it rolled over, frothing at the mouth, and was dead in a few minutes. A post-mortem examination showed valvular insufficiency in both sides of the heart, so the dog could, at the very best, have lived but a short time. This condition is very common among well bred dogs, some authorities placing it as high as five per cent in all well bred dogs of the pet or toy varieties, the symptoms, especially when death does not occur quite so sudden, frequently being mistaken for rabies in countries where the disease occurs. This is the third case observed at this station, the two former ones happening immediately after the victims had been visited by their respective owners, for which reason such visits are discouraged as much as possible.

Bovine Tuberculosis Control Work.

As shown by the appended report of the Assistant Territorial Veterinarian, a recent test of the Waialae Ranch dairy herd shows a relapse which would be highly discouraging were it not for the fact that the probable cause of the same may be eliminated. The previous test of this same herd showed a reduction in the number of tuberculous reactors to nearly one-half of one per cent and great hopes were entertained that the disease was now near complete eradication. It will be remembered that this herd, the largest dairy herd in the county, showed an original infection in the neighborhood of 70 per cent. The owner has labored assiduously at the suppression of the disease and has assisted this Division in every way to this end. But nevertheless the repeated recrudescence of the disease every time when it was practically eradicated, finally led to the conclusion that extraneous infection might, to some extent at least, be the cause thereof and inquiries led to the discovery that a neighboring herd of beef cattle seems to be more or less infected with tuberculosis. Whether beef cattle, or in other words, cattle from which no milk is sold or used for human consumption, under the regulations now in force here, can be dealt with as a center of infection, pure and simple, is a question which must be decided before action can be taken. The fact that bovine tuberculosis, until quite recently, has not been considered or dealt with as a dangerously infectious disease—except when milk from tuberculous cows was concerned—would make a legal decision of the question of the local authorities' right to interfere, without the owner's consent, of doubtful value. It has therefore been found

advisable to await the return to Honolulu of the owner of the above mentioned dairy herd, when action will be taken by him and other dairy men in his neighborhood, to ascertain exactly what can be done in the premises.

In the meantime the annual test is being continued with very satisfactory results among which may be mentioned the fact that the Mokuleia herd of 448 dairy animals, reported as injected (in Dr. Case's report) gave only one single reactor and that a great majority of the smaller dairies are found absolutely free of the infection.

Hog Cholera.

The outbreak mentioned in my report for January as occurring at Puuloa, and which undoubtedly was complicated with salt poisoning, if not entirely due to it, has subsided. A recent outbreak at Mills School, Manoa, was treated with the serum-simultaneous method, the virus being obtained from one of the sick animals on the premises. The results were very satisfactory and will be watched with interest in order to ascertain the length of immunity conferred by this method. A more recent outbreak in the Kapahulu district was treated with the serum alone, but some very sick, and therefore untreated hogs were left with the serum treated ones for the same purpose.

Having read the replies received from the hog raisers to whom copies of the proposed Rule IX were sent, it appears to me advisable that the same be promulgated. With some slight changes in the wording of the section pertaining to the quarantine of infected premises, the printed rule might be made to work automatically as an order to quarantine, when handed to the owner and receipted for. This would obviate the necessity of having special quarantine orders prepared and would simplify the matter considerably.

On the island of Maui a hui of hog raisers have imported 50,000 c.c. of hog cholera serum and placed the same in charge of the deputy territorial veterinarian. Only three outbreaks occurred there during 1915 and all were promptly checked by the use of serum alone.

The Hilo deputy was provided with 1000 c.c. of the serum kept here by the Board, in order to be prepared for eventual outbreaks.

Glanders.

This disease, undoubtedly a relic from the Waipio Valley outbreak in 1911, has made its appearance in Kohala, Hawaii, a mare with a mule colt being reported as suffering from glanders by the local veterinarian, Dr. Rowat. By direction of the Executive Officer, Dr. Elliot went at once from Hilo to Kohala and,

having confirmed Dr. Rowat's diagnosis, had both animals killed and the premises disinfected. Since that time Dr. Rowat found one more case in a neighboring stable, which likewise was destroyed. While there is no serious cause for alarm, the desirability of having a deputy territorial veterinarian in that district becomes manifest. It is, of course, almost impossible for one veterinarian, single handed, to cover an island the size of Hawaii and it is not pleasant to contemplate what might have occurred had Dr. Rowat not been there and located this outbreak while still in its incipiency. If, therefore, the plantation and ranch interests in that neighborhood should unite on recommending the appointment of a deputy for the district, it would undoubtedly become advisable for the Board to coöperate with them in providing for a good man to look after the live stock in Kohala as well as in North and South Kona.

Chicken Pox or Sore Head.

A number of small outbreaks have occurred, and where fresh untreated scabs have been secured the results have been good. Where the sores have been treated, and especially with tincture of iodine, the scabs are of no value for the preparation of vaccine. A number of inquiries have been received from both Hawaii and Maui in regard to this treatment, and the information received that of all the chickens hatched during or after June of each year, about 90 per cent die from sore head. On a recent visit to the Haiku district on Maui (March 19) a demonstration was made of the preparation and injection of the vaccine before some 25 or 30 poultry raisers, all of whom expressed the desire to take up poultry farming on a large scale as soon as convinced that this disease can be cured and prevented by this method.

Importation of Live Stock.

Unusually heavy shipments of livestock were received during the month of February, among which may be mentioned nearly 100 head of mules, 16 registered dairy animals and 175 crates of poultry.

Very respectfully,

Victor A. Nörgaard,
Territorial Veterinarian.

REPORT OF ASSISTANT TERRITORIAL VETERINARIAN.

Honolulu, Hawaii, March 28, 1916.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry,
Board of Agriculture and Forestry,
Honolulu, Hawaii.

Sir:—I beg to submit the following report for the month of February, 1916:

Tuberculosis Control.

The following dairy cattle were tested:

	T.	P.	C.
Waialae Ranch	462	445	17
M. Quintal	2	2	0
W. G. Hall	5	3	0
Kamehameha Schools	2	2	0

A total of 469 head were tested, out of which number 452 were passed and 17 condemned and slaughtered. Besides the above 448 head were injected at W. E. Bellina's ranch at Mokuleia, the results of which will appear in the March report.

Importations of Live Stock.

Matsonia, San Francisco—41 crates poultry, various; 2 crates quail, Wells, Fargo Express Co.

Great Northern, San Francisco—1 dog, Mrs. W. Vierra.

Makura, Sydney—1 dog, Stanley Thomas.

Lurline, San Francisco—30 miles, Alexander & Baldwin; 25 mules, Schuman Carriage Co.; 12 mules, H. Hackfeld & Co.; 3 Duroc jersey hogs and 1 litter of pigs, Lahainaluna School; 11 Holstein cows, 1 Holstein calf, 2 Holstein bulls, Hind, Rolph & Co.; 38 crates poultry.

Sierra, San Francisco—1 dog, Lt. E. C. Ramsey.

Wilhelmina, San Francisco—1 live bear, Bud White; 29 crates poultry.

Manoa, San Francisco—17 crates poultry.

Northern Pacific, San Francisco—21 crates poultry, Ter. Marketing Division.

Alaskan, Seattle—2 Ayreshire bulls, H. P. Faye; 25 mules, A. L. Macpherson.

Manoa, San Francisco—17 crates poultry; 1 crate rabbits, Mrs. J. Santos.

Respectfully submitted,

L. N. Case,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, March 8, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—The following report of operations of the Division of Hydrography during February, 1916, is submitted:

Weather Conditions.

During the first week of the month abundant rains fell on Kauai, Oahu, and part of East Maui. Elsewhere the precipitation was light. During the remainder of the month the rainfall was very light and crops and vegetation are beginning to show the effect of dry weather. The rainfall at the Nuuanu Pali gap was less than four inches in February against 31.2 inches in January.

Construction Work.

The construction work planned for the biennial period ending June 30, 1917, was completed. Two new continuous record stream measurement stations were completed during the month on the Ukumehame and Lahainaluna streams on Maui, and the channel cross sections of the three new stations on the main branches of the Waimea stream on Kauai were cleared of bowlders and debris deposited by the December and January storms.

Special Report.

A special and confidential report relative to government water valuation was furnished the Governor of Hawaii at his request.

Police Work.

W. V. Hardy, Assistant Engineer, in charge of the work on Kauai reports under date of February 29, 1916:

"Our camp on the Koaie stream was visited one evening last week by a courier who reported that a Japanese who was supposed to be demented was roaming the hills near the Waiahulu Stream measurement station. The next morning at sunrise the entire hydrographic force turned out, captured the Japanese, turned him over to the proper authorities and were back at work on the Koaie measurement station at 10:30 a. m. It is reported that the man is improving and will probably recover."

1915 Rainfall Records.

Almost complete rainfall records for the calendar year 1915 show that, except for the high levels of Kauai, 1915 was a much drier year than 1914. The generally heavy rainfall for December, 1915, in many cases at comparatively low levels, exceeded the total precipitation for the other eleven months.

The accompanying tabulation shows interesting records for 1914 and 1915 for part of the data received.

Operation and Maintenance Work.

Kauai.—Three new ditch measurement stations were established and one discontinued. Nineteen stream and ditch measurement stations were visited and seven regular station and three miscellaneous measurements were made. About twelve days were spent collecting and preparing data for the biennial report and a considerable amount of trail improvement work was done.

Oahu.—Fifty-one visits were made to stream and ditch measurement stations and five rainfall measurement stations were visited. Thirty-one stream and ditch measurements were made. The Kalihi, Punaluu, and Kaluanui stream measurement stations were repaired.

Maui.—G. K. Larrison spent the first five days of the month on West Maui, inspecting stations damaged by the January floods, and on reconnaissance of the Olowalu, Ukumehame, Lahainaluna and Kahoma streams.

All continuous record measurement stations and one rainfall measurement station were visited.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

Rainfall Records for 1914 and 1915.

Kauai.

Location	Elevation Feet	Rainfall in Inch. 1914	1915
Mt. Waialeale	5075	610*	590*
Keanakua ridge	4450	110	128
Kohua-Kekoha ridge	3950	118	103
Lehuamakanoi ridge	3930	147	145
Kahana ridge	3750	92.2	99.5
Paukahana ridge	3720	85.4	96.2

* Partially estimated.

Location	Elevation Feet	Rainfall In Inch. 1914	1015
Kaholuamanu ridge	3650	65.4	66.9
Waialae valley	3600	90.8	103.8
Kokee valley	3550	66.0	56.0
Puu Lua	3500	48.3	50.4
Upper Mohihi ridge	3500	95.7	93.6
Waiakoali ridge	3450	86.8	88.9
Upper Olokele ridge	2100	145	133
Upper Hanapepe ridge	2080	258	247
Hanapepe canyon	530	137	130
Waiahi	600	118	102
Waimea village	10	24.5	13.4
Grove Farm	400	79.0	70.1
North Wailua valley	650		114.2
Mr. Newlun's residence, near Kealia	375	103.1	99.9
Kilauea	325	92.9	66.1

Oahu.

Location	Elevation Feet	Rainfall in Inch. 1913	1914	1915
Nuuanu Pali	1200	110	138	138
Luakaha (Reservoir No. 4)	1125	158	199	178
Luakaha	850	143	172	159
Wahiawa	950	...	41.2	50.6
North Fork Kaukonahua (above Wahiawa)	1250	...	332	206
South Fork Kaukonahua (above Wahiawa)	1100	...	...	101
Makaha valley	1400	...	...	74.2

Maui.

Location	Elevation Feet	Rainfall in Inch. 1914	1915
Mt. Eke	4500	303	210
Kukui ridge	4300	431	289
Kukui slope	2350	155	100
Honokohau (Puu Uau)	2300	224	144
Keanae	1000	397	240

Hawaii.

Upper Kawainui	4080	504	215
Lower Kawainui	1040	308	154
Alakahi (lower ditch)	1030	240	116
Waiawa (lower ditch)	980	192	83

Inspection of Nursery Stock and Control of Insect Pests and Plant Diseases

By E. M. Ehrhorn, *Superintendent of Entomology.*

The rigid inspection and disinfection of nursery stock coming into the Territory is the first essential of clean horticulture. This has been recognized now by many countries and Hawaii was luckily one of the first to establish such laws with rules and regulations to enable this important work to be carried on in a businesslike manner. These laws are so formed that they protect the individual grower from the careless and oftentimes unscrupulous dealer and the community from the invasion of destructive pests of the field and garden.

When shipments of packages of fruit, plants, trees, bulbs or seeds arrive, either as freight or mail matter, the inspectors take full charge of the same and carefully examine all these shipments. The steamship companies hold all shipments until they have been inspected and passed by the inspectors. If, upon inspection, the fruit, plants, bulbs or seeds are found to be free from insect pests or plant diseases they are immediately passed and the transportation company notified. If, however, the shipment is found infested with insect pests or plant diseases not found in the Territory, the shipment, box and all, is immediately destroyed and the consignee is notified thereof and a certificate, stating the reason for destroying the shipment, is furnished him as a counter claim against the careless dealer. In case of fruit or vegetable shipments in large quantities, the consignee can return them to the original shipper if he so desires. If any shipment is found infested with pests already known to exist in the Territory, they are disinfected in such a manner that the insects or diseases are killed before the consignee can receive them.

The methods of disinfection vary for the various kinds of shipments. For all seeds, such as beans, peas, bulbs and garden seeds, carbon-bisulphide ("Highlife," as it is commonly called here) is used. Carbon-bisulphide is an ill-smelling liquid which is highly inflammable, producing by evaporation a very heavy gas, which is capable of penetrating into the tightest packing. To fumigate any seeds or bulbs it is necessary to have a tight compartment. The materials are placed in this and the carbon-bisulphide is poured into a shallow dish placed on top of the material to be fumigated. As the liquid evaporates the heavy gas descends to the bottom of the compartment and gradually rises until it covers all the material contained therein. The compartment,

which should be air-tight, should remain closed for from 24 to 48 hours, according to the condition of the material which is to be fumigated. The greatest care should be exercised in handling carbon-bisulphide, because it is very inflammable and no light or lantern should be used, nor should anyone be smoking while handling it. One pound of carbon-bisulphide is used for every 1000 cubic feet of space. Weevily beans or seeds, wormy tobacco, corn, wheat, or meal infested with beetles or moths, household furniture, carpets, furs, anything infested with wood borers or other vermin, can be freed by subjecting these to the fumes of carbon-bisulphide.

The best method for all forms of insect pests either attached to live plants or crawling about in the packing used in the shipments, is the hydrocyanic acid gas fumigation. This is also a very dangerous gas because it kills instantly everything it comes in contact with except plant life. Great care must, however, be taken, even with plants because if moist they will absorb a certain amount of the gas or cause it to precipitate on the moist spots and burning of the foliage and even of the tender wood will result. However, if the shipment is dry or is allowed to dry no bad effects are experienced.

Many people are ready to blame the inspector for damaging their plants by fumigation, but if they could see upon arrival the various shipments that are damaged before the inspector touches them they would realize that the greatest damage is done by the careless shipper of plants. We, here in Hawaii, are a long distance from other countries whence shipments of plants are made. If ordered from some point on the Atlantic Coast, for example, we can count on a three weeks' trip. If the necessary precaution is taken to thoroughly ventilate the shipments the plants will arrive in fairly good condition, but if poorly packed, usually too closely, and no ventilation to speak of, then we have a mass of decayed vegetation unrecognizable at times, and worthless to say the least. In small shipments, by mail from distant points, it is the reverse. The shipper usually sends a few plants packed in a flimsy cardboard box with a little moss which was once moist, about the roots, thinking that he is sending the plants to some nearby town, and upon arrival here the plants are as dry as old bones—absolutely worthless. The inference usually is that they were killed by the inspector here. The science of fumigation has reached such a state that the most delicate fern can be fumigated without turning a leaf, but it is all in knowing how to do it.

The disinfection of diseased plants, as far as horticultural inspection goes, is not at all satisfactory and generally diseased plants which are more or less worthless, are destroyed. For suspected cases of blight or rust on roses, dipping the plants in a strong solution of Bordeaux mixture will insure freeing them

from this trouble. Bordeaux mixture is made as follows: Dissolve 4 pounds of bluestone (copper sulphate) in a wooden tub in about 5 gallons of water. Slake 5 pounds of quicklime and thin it to a creamy whitewash. Pour the whitewash very slowly through a wire screen into the copper solution. Stir the mixture thoroughly and add enough water to make 25 gallons in all. Stir occasionally while dipping the plants as the material settles very easily. Never make the Bordeaux mixture in an iron or metal vessel as the copper will go to the iron and the effect of the wash is neutralized. Never allow the wash to stand over night. This remedy can be used as a spray for infected plants in the garden.

For black aphis on ferns a soap wash will give good results. Dissolve one pound of whaleoil soap in 4 gallons of hot water and when thoroughly dissolved spray the ferns with this hot solution, using a fine atomizing sprayer. The reason for applying the liquid warm is that the insects are greasy and the warm solution will cling to them better than a cold solution. This remedy is also effective for plant lice or scale insects attacking garden plants, such as roses, vegetables, etc., or potted house plants. The next day after spraying the plants can be washed off with warm water as a spray, or if in the garden, with the hose using a fine nozzle. The natural means of control, by the use of ladybugs and parasites, generally are sufficient to keep down these pests and it is only in severe cases, when climatic conditions are favorable to the increase of pests and unfavorable to the increase of the ladybug or parasite, that we need apply artificial remedies. In the house or conservatory, where these friendly insects are not found, we are forced to rely upon artificial remedies.

Cutworms, the larvae of owlet moths, give much trouble at times, especially to young plants, but if taken in time and either poisoned with poisoned bran bait or hunted in the soil and killed by crushing, they can be kept down to a minimum.

The Japanese rose beetle is another annoying pest and requires constant attendance if one cares for perfect flowers. This beetle during the wet season is not as abundant as during the dry season on account of being more easily attacked by the beetle fungus, which kills it very readily. Nevertheless, collecting beetles in the evening while they are feeding will do much for those who have small yards and are interested in their plants.

Whenever pests are found injuring plants it is best to procure specimens of the same and submit them to the Superintendent of Entomology who can then give the necessary advice for their destruction.

The fruit season is rapidly approaching and no doubt many peaches, mangoes and other fruits will be attacked by fruitfly. Thousands of parasites have been liberated in many sections of

the country and are doing good work in keeping down the fly. However, we must assist the parasites and instead of collecting fallen fruit and burning it and in that way not only destroying the maggots which are in the fruit, but with them also the grubs of the parasites contained in those maggots, it is best to collect all this fruit and pile it in a shady, out-of-the-way place under some bush. The fruit will decay and the maggots will crawl into the ground and a good per cent will furnish a new supply of parasites. Wherever this has been done a marked improvement has been noted. A little assistance in this way will insure the protection to the parasite in the future. We have reared parasites from many fruits gathered at different times and know that the parasites are present, so that with the assistance above noted, a marked increase in parasitism will result and better fruit will be produced.

Currant and gooseberry bushes, which grow in all parts of the United States, are the host plants for the fungus of the white pine blister, and from these plants the disease spreads to the pines. The department of agriculture announces that a federal and state campaign is being waged against the further spread of this pest, which has already gained a foothold in the eastern states.

Of two large shipments of lambs from the Wyoming national forest, one averaged eighty and the other eighty-four pounds per head on the scales at Omaha. The average weight of 50,000 head of April and May lambs from the Madison forest in Montana, after being shrunk for twelve hours, was 75.7 pounds each. From a band of 900 ewes grazed on the Beaverhead Forest, Montana, the owner raised and shipped 880 lambs which averaged 97 pounds per head after being driven fifty-five miles to the shipping point.

The Treatment and Prevention of Sore-Head, or Chicken Pox, by Means of Vaccination.

INTRODUCTION.

Every poultry raiser in this Territory is familiar with the sores and tumors on the comb and wattles, and diphtheritic exudations in the eyes, nostrils and mouths of chickens, which characterize this disease. It is, therefore, not necessary here to discuss its nature or cause beyond stating that it is a highly contagious disease affecting chickens, turkeys and pigeons, and, to a much less extent, water fowl and guinea hens. When once the disease gains entrance to a flock it spreads quickly and since the infection is very resistant to disinfectants, it is difficult to eradicate it. The need for the immediate isolation of all diseased fowls from the flock, the removal and burning of all dead fowls, and the cleaning and disinfecting of the houses and yards, is apparent.

TREATMENT.

The usual manner of treating sore-head is by removing the scabs or crusts as soon as they form, and then apply to the raw surface various chemical disinfectants, such as silver nitrate, copper sulphate, permanganate of potash or tincture of iodine. When the disease is of a mild form, and the birds fully grown and strong, this treatment at times serves to check it, but in most cases it is of doubtful value. It is, therefore, of great interest to all poultry raisers and fanciers that a new method of treatment has been found which seems to be very promising, both as a preventive and a cure. This treatment was first suggested in 1910 by a German scientist (Manteufel), but it was not until American investigators (Hadley and Beach, 1913; W. B. Mack, 1915, and J. R. Beach, 1915) had devoted much time and study to its development and standardization that the present method of preventive vaccination has been evolved.

PREVENTIVE VACCINATION.

The principle of this treatment consists in the preparation of a vaccine from the crusts and scabs which form on the comb and wattles of the affected birds, and the injection of this vaccine beneath the skin of both affected and exposed birds. The method of preparation is very simple and can be undertaken by anyone who is in possession of a good dairy thermometer and understands the first principles of absolute cleanliness. But as many

poultry raisers will feel timid about injecting into valuable birds a solution which they know contains the disease germ, it may be safer for them first to learn to administer the vaccine and satisfy themselves of its beneficial effect, before they attempt to prepare it. For those who feel this way about it, the following is suggested.

COLLECTING AND FORWARDING SCABS FOR VACCINE.

Until such a time as poultry raisers in the Territory feel confident of the value of the vaccination treatment, the Territorial Veterinarian will prepare and, whenever possible, return by first mail the vaccine made from scabs forwarded to his office for this purpose.

When care is taken promptly to isolate all affected birds, the disease as a rule spreads slowly, and as it is necessary that a sufficient quantity of crusts or scabs should form in order to obtain material for the treatment of the entire flock, there is little danger of heavy losses even if four to six days will be required for the forwarding, preparation and return of the scabs and vaccine.

The best scabs, and in fact the only ones to use for vaccine, are those which form on the comb, wattles and the skin of the head. In no case use the exudate which forms in the eyes, nostrils or mouth. Place the scabs in a small bottle, previously cleaned with boiling water and drained until dry. At least one heaping teaspoonful of scabs will be required for the vaccination of a flock containing from 75 to 100 birds, but as this quantity provides for two injections, (the second injection following the first after five to seven days), it is not necessary that the entire amount should be forwarded at once. For a flock of 25 to 30 chickens, a much smaller quantity will suffice for the first injection, and as the treatment does not immediately stop the further development of sores or tumors, a sufficient quantity of scabs for the second treatment will usually develop during the interval between the two injections. The second crop should, therefore, be forwarded not more than five to seven days after the first was sent.

Wrap the bottle well and place it in a small box or mailing case plainly addressed to the Division of Animal Industry, Board of Agriculture and Forestry, Honolulu, and send it by special delivery. Full information concerning the number, class, breed and age of the birds to be treated must accompany the shipment, as well as plain instructions as to where the vaccine should be returned.

METHOD OF PREPARING THE VACCINE.

The method of preparing the vaccine, vaccination, precautions to be observed, and treatment, evolved by Dr. J. H. Beach of the University of California, and the ones which have been followed here, are substantially as follows:

One-half gram of chicken-pox scabs to 100 cubic centimeters * of physiological salt solution is the proportion used. The scabs are first weighed out and ground in a sterile mortar with a small amount of the sterile salt solution until they are pulverized. This material is then filtered through absorbent cotton into a sterile flask or bottle and the remainder of the salt solution poured through the filter so as to wash out as much of the pulverized material as possible. The flask is then stoppered, placed in a water bath and heated at a constant temperature of 55° Centigrade † for an hour. The vaccine is now ready for use. It is very essential that the vaccine be used as soon after preparation as possible. Since no preservative is used it will deteriorate if allowed to stand.

METHOD OF VACCINATION.

The vaccine is administered by injecting it beneath the skin with a hypodermic syringe. Two doses of one cubic centimeter each are given five to seven days apart. The most convenient place for administration is beneath the skin of the side under the right thigh, the skin at that point being comparatively free from feathers. The left wing is held back, the fowl laid on its left side, and the right wing and leg and feathers held back with the last three fingers of the left hand. The exposed skin is then cleansed with a piece of cotton saturated with disinfectant solution (2 percent solution of compound solution of cresol) and picked up with the thumb and forefinger of the left hand. Then with the right hand the syringe needle is inserted beneath the skin and the proper dose injected. A syringe of one cubic centimeter capacity is well suited for this work, when small flocks are to be treated. (Ask your druggist for Cutter's Tuberculin Syringe.)

PRECAUTIONS TO BE OBSERVED.

1. The vaccine being in an unpreserved condition will soon decompose and become unfit for use. Therefore, if possible, it should be used within three days. If old, decomposed vaccine is used bad results will follow.
2. Vaccine should be kept in a cool place, on ice if practicable, until used and only one bottle opened at a time.
3. A small, wide-mouthed, covered vessel, such as a quarter-pint milk bottle or a jelly-glass, should be provided as a vaccine container from which to fill the syringe. This should be sterilized by boiling before it is used and should be kept covered at all times except when the syringe is being filled.
4. The syringe should be sterilized by boiling, or by soaking for several minutes in a ten per cent solution of compound solution of cresol, followed by rinsing with boiled water.

* One cubic centimeter=approximately 15 drops.
† 55° centigrade=131° Fahrenheit.

5. All diseased fowls should be removed from the flock and treated.

6. The immunizing effect of the vaccine does not take place immediately; therefore, the fowls already infected at the time of vaccination or soon after will, in most cases, develop chicken-pox lesions. Such cases are usually very mild and will soon recover if the fowls are removed from the flock and the lesions treated.

7. The hypodermic needle should be inserted *just under the skin* and not in the muscle.

TREATMENT.

Of the various kinds of disinfectants recommended for the treatment of this disease *tincture of iodine* has been found to be the most satisfactory. The scabs which form on the sores of the comb, wattles or skin should be removed with a dull knife or with the nails, and tincture of iodine applied to the exposed surface.

Collections of exudate on the mucous membrane of the mouth should be removed with forceps or a scoop and the exposed membrane treated with tincture of iodine. All collections of exudate within the eyelids can usually be removed by pressing with the thumb and finger tips around the eye. If any of the exudate should adhere to the eye it should be removed with forceps and it may sometimes be necessary to use forceps also in removing the exudate from beneath the third eyelid at the inner corner of the eye. Afterwards drop a small amount of tincture of iodine into the eye.

The tincture of iodine can be applied most conveniently in all cases with a medicine dropper. Treatment should be repeated as often as the scabs or exudate reform. Any fowl that does not show a marked improvement in condition after three or four treatments will usually recover very slowly. In such cases, unless the fowl be very valuable for show, breeding or other purposes, it is more economical to destroy it than to give further treatment.

Collections of exudate within the nasal cavities always produce marked swellings of the face. This condition is relieved by making an incision through the skin over the swelling, removing all the exudate with a pair of forceps or scoop, and then packing the cavity with absorbent cotton saturated with tincture of iodine. The cotton pack is necessary to keep the incision through the skin from healing too rapidly. If not packed, the wound will quickly heal, the exudate reform, and no benefit be derived from the operation. The pack also assists in controlling the hemorrhage, which is always severe. When the hemorrhage is unusually severe, it should be checked by the application of a strong caustic, such as silver nitrate. The cotton pack should be removed, the wound cleansed and a new pack put in every two or three days as long as the exudate continues to form. When, upon removal of the

pack, it is found that no exudate has formed, the pack may be left out and the wound allowed to heal. The administration of vaccine in addition to local treatment will shorten the course of the disease and decrease the mortality from all types of the disease.

BY AUTHORITY.

TERRITORY OF HAWAII.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

RULE II. DIVISION OF FORESTRY.

The Board of Commissioners of Agriculture and Forestry hereby makes the following rule and regulation for the preservation and administration of forest reserves:

Section 1. The following acts are hereby forbidden on government lands in forest reserves of the Territory of Hawaii and declared to constitute trespass punishable by fine:

(a) The cutting, killing, destroying, girdling, chopping, injuring or otherwise damaging, or the removal, of any timber, young tree growth, or any other material, except as authorized by permit from the Superintendent of Forestry.

(b) The grazing of any livestock, except as authorized by permit from the Superintendent of Forestry.

(c) The hunting of any wild animals, except as authorized by permit from the Superintendent of Forestry.

(d) Having or leaving in an exposed or insanitary condition camp refuse or debris of any description, or depositing or being or going thereon and depositing in the streams or other waters within or bordering upon government lands in the forest reserves any substance or substances which pollute or are liable to cause pollution of the said streams or waters.

(e) The going on or being upon government lands within a forest reserve with intent to destroy, molest, disturb, or injure property belonging to the Territory of Hawaii, or used by the Territory of Hawaii in the administration of the forest reserves.

(f) The wilful tearing down, defacing, or disturbing of any public notice or survey monument posted within a forest reserve.

(g) Squatting upon government land in a forest reserve, or constructing or maintaining any kind of works, structure, fence, inclosure, road or trail, without a permit, except as otherwise allowed by law.

(h) The tearing down, breaking down or through, or molesting in any manner of a forest reserve boundary fence or gate or a fence or gate on government land within a forest reserve.

Section 2. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00), as provided by Section 529, Revised Laws of Hawaii of 1915.

Section 3. This rule shall take effect upon its approval by the Governor.

Approved:

LUCIUS E. PINKHAM,
Governor.

Honolulu, Territory of Hawaii, April 5, 1916.

TERRITORY OF HAWAII.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

RULE III. DIVISION OF FORESTRY.

The Board of Commissioners of Agriculture and Forestry hereby makes the following rule and regulation for the purpose of protecting from contamination the drainage areas tributary to the Honolulu water supply system in Nuuanu Valley, within the Honolulu Watershed Forest Reserve:

Section 1. All persons, except forest rangers and other persons employed by the Territory of Hawaii, by the City and County of Honolulu, by the United States, and by telephone and electric companies, in the discharge of their duties, are hereby prohibited from trespassing, and all persons are hereby prohibited from allowing any stock to graze, upon that portion of the Honolulu Watershed Forest Reserve, herewith described, to-wit:

Beginning at the Government Survey Trig. Station "Pali (New)" above the Nuuanu Pali Road, as shown on Government Survey Registered Map No. 2554, and running:

1. In a Southeasterly direction along the summit of the Koolau Range to the junction of Nuuanu and Manoa Valleys at a peak called Konahuanui;

2. Thence Southwesterly down the dividing ridge between Nuuanu and Manoa Valleys to the Government Survey Trig. Station "Kaumuhonu" on the peak of that name;

3. Thence still Southwesterly down the dividing ridge between Nuuanu and Pauoa Valleys, to a prominent peak in said ridge about 3000 feet Southwest of Kaumuhonu;

4. Thence Northwesterly down a well defined lateral ridge to the edge of a deep gulch, across said gulch, over and across grass land, to the Luakaha Falls, the boundary being, however, a direct line from the top of the peak described in Course 3 to the Luakaha Falls;

5. Thence down said falls and the middle of Nuuanu stream to its junction with an angle in the boundary of Grant 4561, Sec. 2 (Luakaha of C. M. Cooke);

6. Thence Northeasterly and Northwesterly along the mauka boundary of Grant 4561 (Luakaha of C. M. Cooke) and across the Nuuanu Pali Road to the Northwest or Ewa side of said road;

7. Thence Southwesterly down along the Northwest or Ewa side of said road to its intersection with the mauka boundary of Grant (P. W.) 7 to J. A. McCandless;

8. Thence along the mauka boundaries of Grant (P. W.) 7 to J. A. McCandless, Grant 5476 to A. Lewis, Jr., Grant (P. W.) 45 to A. Lewis, Jr., and across the old Nuuanu Pali Road to the East corner of Grant 6028 to J. R. Galt;

9. Thence along the mauka and Ewa boundaries of Grant 6028 to J. R. Galt, Grant 5572 to A. F. P. McIntyre, et al., Grant 5552 to Charlotte A. Carter, et al., Grant (P. W.) 42 to A. L. C. Atkinson, Deed of Kamehameha III to Niniko dated June 15, 1854, and recorded in Liber 26, p. 53, to the Waolani Ridge and along said ridge to the dividing ridge between Nuuanu and Kalihi Valleys;

10. Then Northeasterly along the dividing ridge between Nuuanu and Kalihi Valleys to the main Koolau Ridge;

11. Thence Easterly along the summit of the Koolau Range to the point of beginning.

Sec. 2. This prohibition shall not apply, however, to the use of the main government road for the purpose of travel and transportation within the area described in Section 1.

Section 3. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00) as provided by Section 529, Revised Laws of Hawaii of 1915.

Section 4. This rule shall take effect upon its approval by the Governor.

Approved:

LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii, March 31st, 1916.

FOREST RESERVE HEARING.

DISTRICT OF HONOLULU, ISLAND OF OAHU.

Notice is hereby given that under the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, a public hearing will be held by the Governor of the Territory and the Board of Commissioners of Agriculture and Forestry on Monday, the 24th day of April, at 2 o'clock p. m., in the office of the Board of Commissioners of Agriculture and Forestry, Government Nursery, King street, in the City and County of Honolulu, to consider the setting apart as a forest reserve, to be known as the Manoa Ranger Station, of a portion of the government land of Kahoiwai, in Manoa Valley, District of Honolulu, Island of Oahu, having an area of 15.36 acres.

A map and description of the said land to be set apart as a forest reserve are on file in the office of the Superintendent of Forestry, in Honolulu, where they are open to the inspection of the public.

At the said time and place all persons who so desire will be given full opportunity to be heard upon the subject matter of this notice and to present evidence and arguments in person, by proxy, or by letter, either for or against the setting apart of said land as a forest reserve.

LUCIUS E. PINKHAM,
Governor of Hawaii.

The Capitol, Honolulu, April 5th, 1916.

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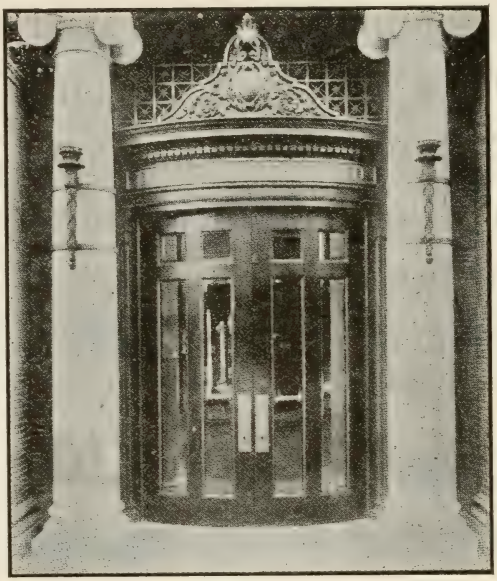
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THE HAWAIIAN FORESTER AND AGRICULTURIST

JUNE, 1916

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Board of Agriculture and Forestry

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, JUNE, 1916. NO. 6

The late appearance of this issue of the Forester and the accumulation of routine reports of the Superintendents for three months is unavoidable, due to the absence from the Territory of several of the Commissioners, which left the Board for a period without a quorum.

The work of forest fencing to prevent cattle from getting into the Territorial reserves is progressing satisfactorily on several of the islands, and is an important step in the better protection of this valuable government asset.

It is hoped that the detection and prompt destruction of thimbleberry bushes found in Palolo Valley in March will prevent the spread on this island of a pest which has proved to be so obnoxious on parts of Hawaii and Maui.

Field Entomologist D. T. Fullaway arrived in Honolulu from Manila on May 10, bringing with him in good condition parasites on the melon fly which he secured in India. Since his arrival he has been able to multiply these successfully, and before long there will be a sufficient number for distribution. Raisers of cucumbers, melons and other vine fruits may soon reap the benefits of this parasitic introduction, and be able to produce cleaner fruit.

Benefits from the introduction and use of the new cure for sorehead in chickens and other fowls have already been felt by poultry raisers, and hundreds of birds, which otherwise would have died, have been saved. It is safe to predict that the price of eggs and chickens will before long be greatly lowered from the present high plane, on account of this cure.

The successful introduction and spread of the algaroba tree in these islands has interested many in other parts of the world where similar climatic conditions exist. This has been evidenced by requests for algaroba seed from parts of South Africa, Southern Australia, China and Madagascar.

The Manoa Ranger Station, the proclamation of which appears in this issue, will be not only a valuable and accessible area for

experiments in tree growth and acclimatization, but also important as headquarters in the field administration of the Honolulu Watershed Forest Reserve.

The continued presence of wild goats on the Kahoolawe Forest Reserve bids fair to present further opportunities for the marksmanship of members of the National Guard and others interested in rifle practice.

Interest in tree planting in the Territory is by no means on the wane. The Division of Forestry recently received an order for 200,000 trees from one sugar plantation alone, which is looking forward to a continued and cheap fuel supply.

Division of Forestry

REPORT FOR MARCH.

Honolulu, Hawaii, April 29, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of March, 1916:

FOREST FENCING.

The work of repairing the Pupukea Forest Reserve boundary fences, Oahu, in coöperation with the ranch department of the O. R. & L. Co., was completed during the month at a cost of $89.31. This fence was originally constructed by the Board in 1910. The total length of fence repaired and made stockproof again is 1.70 miles.

In accordance with the desire of the Board, expressed at the February 17 meeting, the matter of fence moving in the Waianaekai Forest Reserve, Oahu, by Mr. Thomas Makia, was brought to a conclusion. On March 6 Mr. Makia moved his fence at my direction with the assistance of some of the laborers who were repairing the Lualualei Reserve boundary fence.

A surveyor from the government survey office was engaged during most of the month in surveying out the boundaries of government lands at the northwest corner of the Hilo Forest Reserve preliminary to the fencing and riddance of cattle from the reserve, which will soon be undertaken at Piha.

A stretch of fence about 100 feet in length was constructed across the end of the old Nuuanu Valley road near the No. 2 reservoir to assist in keeping trespassers away from the water.

On account of an irregularity in bids, the fencing of Section A of the Olaa Forest Park Reserve, Hawaii, was readvertised.

THIMBLEBERRY IN PALOLO VALLEY.

The presence of thimbleberry bushes, *Rubus jamaicensis*, in Palolo Valley was reported to this office on March 13 by the Consulting Botanist, Mr. J. F. Rock, and on March 20, 22 and 31, with the assistance of Ranger Hipple and laborers of the division, I located, pulled up and destroyed by burning three different patches of this pest in upper Palolo Valley at the lower edge of the native forest. This thorny plant is such a pest on parts of Hawaii and Maui, and overruns the pastures and woodlands there so rapidly, that it would be a great pity to allow it to become established on this island. For this reason radical steps were taken at once to locate and root it out in Palolo Valley.

Rule XIII of the Division of Entomology forbids the transportation of this plant in any form from one island to another, and authorizes agents of the board to destroy it wherever found. The owner of the land in Palolo Valley, where the thimbleberry bushes were discovered and destroyed, has been notified and requested to coöperate in eradicating this plant pest from this region. The thimbleberry has also been recently found back of Sugar Loaf on Tantalus, and will be eradicated at once. All infested areas after the destruction of the bushes, will be kept under observation to prevent young plants coming up from the roots or seeds.

RULES II AND III.

A part of the month was occupied in drafting and getting ready for presentation to the Board, Rules II and III of this division, which subsequently have been approved by the Governor and published.

Rule II is a general rule for the protection and administration of government lands in the forest reserves throughout the Territory, and gives the necessary authority to prevent acts of trespass and destruction which are detrimental to the best interests of forestry. The promulgation and enforcement of this rule will accomplish much toward the better administration and protection of our forest reserves. Hitherto the division has acted in this respect without the authority which this new rule gives. The provisions of this rule are largely based on the regulations of the U. S. Forest Service, which have been in effect on the mainland national forests for many years with success.

Rule III is local in its application and was promulgated in the effort to prevent the contamination of the water in the three upper reservoirs in Nuuanu Valley within the Honolulu Watershed Forest Reserve.

Both rules were published in the May number of the Forester.

FUEL STUDY.

During the month the contemplated study of the supply and demand for fuel wood in the Territory was begun, and a list of questions was sent out to 70 wood users and dealers, including all of the sugar plantations and larger ranches in the Islands. An endeavor is being made in this study to ascertain the total amount and kinds of wood used for fuel during the year 1915, the place where produced, the place and cost where used, and the ways and means of cheapening this commodity. Those addressed in this study have been very ready in their replies, and the results when compiled can not but help in the solution of this important fuel supply problem.

MISCELLANEOUS.

On March 3, in company with the Forest Nurseryman, I inspected the extensive eucalyptus plantation at Kunia, Oahu, and found the trees doing remarkably well under the arid conditions existing in this region, although some windfall damage had been done by the recent kona storms.

The permit of Mr. C. M. Hudson to gather awa in the Puna Forest Reserve was extended for one month, or until April 1, to enable the permittee to remove the awa root which he had purchased.

In addition to the eradication of the thimbleberry, mentioned above, the Forest Nurseryman and his assistants have been engaged in destroying another pest in Makiki Valley, as described in Mr. Haughs' accompanying report. This pest, *Caesalpinia bonduc,* is a climbing vine with very wicked thorns, and tends to overrun and kill everything within its reach. It will be completely eradicated in this region.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, April 17, 1916.

The Superintendent of Forestry, Board of Agriculture and Forestry, Honolulu, Hawaii.

DEAR SIR:—I herewith submit a report of the principal work done during the month of March, 1916:

Nursery.—Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold	2000	100	20	2120
Gratis		300	522	822
	2000	400	542	2942

Collections.

Collections on account of plants sold amounted to.....	$ 3.45
Rent of building, Nursery grounds, for January.....	35.00
Government realizations	$38.45

Preservation Forest Reserves.—Collections.

Mar. 31	Rent of premises at Half-Way House, Tantalus, for January, February and March at $10 per month	$30.00
	For use of two acres of land, Kalawahine, at $20 per year, for January, February, March	5.00
	For use of land and gathering Ti leaf, Kalawahine, Pauoa Valley, at $50 per year, January, February and March	12.50
	Rent of small piece of land, Kalawahine, at 25c per month	.25
	For 26 loads black sand at 25c per load from Makiki Valley	6.50
		$54.25

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 19,500 in seed boxes and 350 in transplant boxes; total, 18,850.

Makiki Station.

The work done at this station consisted of mixing and sterilizing soil, transplanting seedlings and doing other routine work.

Honolulu Watershed.

The work done on the section of the Honolulu Watershed lying between Makiki Valley and Round Top Hill consisted of clearing away grass and brush from the trees and rooting out the pest *Caesalpinia bonduc*. A number of patches of *C. bonduc* have been located in Hering and Makiki valleys, and we are striving to eradicate it entirely.

Advice and Assistance.

The writer has been called upon to make visits and otherwise give advice and assistance, as follows: Calls made to places in and around city, 12; number of persons asking for advice by telephone, 14; number of persons asking for advice by letter, 6; number of persons calling at Nursery for advice, 10. Total, 42.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

REPORT FOR APRIL.

Honolulu, Hawaii, June 15, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of April, 1916:

FOREST FENCING.

Two bids for fencing the four parts of Section A of the Olaa Forest Park Reserve, near 24 Miles on the Volcano road, Hawaii, were received and opened on April 1. One was for $3895 and the other $1975. The contract was awarded to the lowest bidder, I. Erickson, and work on the project began on April 15. The wire was furnished by this division from the supply on hand, and posts are being obtained from local ohia trees. The total length of the fence will be 5.62 miles, and it will protect the magnificent tree fern and ohia forests from dairy stock which now runs at will in this region. The fence is to be completed by September 6, 1915.

The repairs to the Lualualei Forest Reserve boundary fence on Oahu have progressed during the month and several miles have been strengthened and made stockproof and the cattle driven from the reserve.

RULES II AND III.

Rule II of this division, covering the general administration and protection of forest reserves, was approved by the Governor on April 5, and Rule III, relating to trespassing on the Nuuanu Watershed, was approved by the Governor on March 31. The publication of both rules began on April 13, and they now have the full force and effect of law. Copies of the rule have been printed and distributed.

KAUAI TRIP.

From April 6 to 12 I was on Kauai with the Governor, at his request, and with him investigated a complaint against Ranger Lovell. It appears that after an attempt had been made to turn stock into a part of the Kealia Forest Reserve, the ranger had put a lock on the boundary fence gate. A key had been given to the reservoir keeper, who must pass through this gate, but the controllers of the adjacent land, who also have occasion to pass along this road, complained of being shut out. The matter was settled by giving additional keys to responsible parties who must neces-

sarily use this gate to get to private land in the reserve. In the effort to rid the reserve of stock, the ranger had also killed a young cow of doubtful ownership. He was instructed to try to drive out such stock in the future and not to kill any unless specially ordered.

HAWAII TRIP.

From April 15 to 22 I was on Hawaii in company with the Territorial Surveyor and inspected the forest reserve and government land boundaries in the region of Piha, in the Hilo Forest Reserve, which had been run out and marked on the ground by a government surveyor. As soon as the map resulting from this survey is received I will be in a position to recommend the necessary fencing and take steps for the riddance of stock and protection of the government lands in this part of the reserve. A portion of the Mauna Kea Reserve was also visited and the boundary fence found to be in good condition.

Before returning to Honolulu I pointed out to the government surveyor, preliminary to a final survey, the approximate boundaries of a proposed new reserve on either side of the Volcano road between about 4 Miles and 6½ Miles in Waiakea, Hawaii. As soon as the description and map of this area are received, it will be recommended for creation as a new forest reserve.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, May 24, 1916.

The Superintendent of Forestry, Board of Agriculture and Forestry, Honolulu, Hawaii.

DEAR SIR:—I herewith submit a report of the principal work done during the month of April, 1916:

Nursery.—Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	200	163	363
Gratis	900	1916	2816
	1100	2079	3179

Collections.

Collections on account of plants sold amounted to	$ 5.25
From Oahu Railway & Land Co., $33.46, being balance due Bd. of A. & F. for material supplied in repairing Paumalu-Waimea Forest Fence	33.46
Total	$38.71

Collection and Exchange of Seed.

We have several orders for seed on file which come from corporations and others who are contemplating planting large numbers of trees in the near future. The following letter from Chief Forestry Office W. R. Rutter, Uganda Protectorate, South Africa, is self-explanatory and may be of interest to tree planters:

"March 7, 1916.

"Sir:—It is with great pleasure that I write to inform you that the *Prosopis juliflora* has taken very kindly to this country. The germination of the seed was excellent, and the young trees are in a flourishing condition. We now have about three acres of this species planted 4x4.

"As the area I have to plant is very large, I should esteem it a favor if you could arrange to let me have another five pounds of the seed.

"I would be quite willing to bear the cost of any extra labor required for extracting the seed from the pulpy pods.

"Trusting that you can assist in this matter, I have the honor to be, sir,

"Your obedient servant,

"W. R. Rutter,
"Chief Forestry Officer, Uganda Protectorate.

"David Haughs, Esq., Forest Nurseryman,
"Division of Forestry, Honolulu, Hawaii."

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 21,000 in seed boxes, 3000 in transplant boxes, and 500 pot grown; total, 24,500.

Makiki Station.

The work at this station has been principally routine. We have received an order for all the willow cuttings we can spare. The order came from a Portuguese company which intends going into

the business of basket and furniture making. The willows are now ready for cutting and we will supply the company with as many cuttings as we can spare.

Honolulu Watershed Forest Reserve.

The work of rooting out the *Caesalpinia bonduc* in Hering Valley constituted the principal work done during the month. In about ten days more we expect to have it entirely eradicated from this valley. In Makiki main valley there are several patches of *C. bonduc* which we intend rooting out as soon as we can get at it.

Advice and Assistance.

At the request of T. A. Clowes, acting principal Lahainaluna School, Lahaina, Maui, for information in regard to planting trees on lands belonging to the school, the writer paid a visit to Lahainaluna on April 8 for that purpose.

An examination of the land intended to be planted was made and advice given in regard to planting. The algaroba trees sent from this Nursery in February were also examined and were found to be doing very well. Owing to the dry condition of the land no more planting will be attempted until about November or December. We will then have suitable trees ready for planting the tract.

The following is the number of requests received for advice and assistance from people in and around the city: Calls made, 12; advice by telephone, 15; advice to callers at Nursery, 11; total, 38.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

REPORT FOR MAY.

Honolulu, Hawaii, June 16, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of May, 1916:

PERMITS TO SQUATTERS.

In order to legalize the occupancy of certain land in lower Makiki Valley within the Honolulu Watershed Forest Reserve, in compliance with Clause g, Section 1, of Rule II of the Division of Forestry, which forbids squatting upon government land in a forest reserve without a permit, I issued on May 10 free

permits to 17 Hawaiian squatters who are occupying this land in accordance with an arrangement of my predecessor. These permits are for only one-year periods and will be renewed if the squatters comply faithfully with the forest laws and rules and regulations of the Board pertaining to forestry.

AWA PERMIT.

Under the original permit and extensions given to Mr. C. M. Hudson of Hilo to gather two tons of mature awa root from the Puna Forest Reserve, he was able to locate and gather only 1607 lbs. dry weight. Rather than to extend the old permit, and in order to permit him to utilize the balance of $59.82 remaining on his deposit, Mr. Hudson was issued a new permit on May 15, which allowed 60 days for gathering the balance of 2393 lbs. He stated that he had located enough of the root to produce this amount. During his operations, Mr. Hudson has found awa root much more rare on government lands than he had imagined, and so scarce in the Hamakua Pali Forest Reserve that he probably will not be able to collect any awa root under the permit given him for this reserve last October.

MANOA RANGER STATION.

The hearing for the Manoa Ranger Station was held on April 24, and there being no objections raised against the creation of the reserve, the Governor signed the proclamation on May 9, and on May 16 it was published. This small area of a little over 15 acres is a valuable addition to our forest reserve system because of its central location, and will be most useful as an administrative base and site for experiments in tree growth. Plans for its improvement will be taken up with the Board in a special report.

PROPOSED NEW RESERVE AT WAIALUA.

During the month the first steps were taken toward the creation as a forest reserve of a large tract of government land at the higher elevations north of Kaala, in the Waialua district, Oahu. On May 25 I took a government surveyor to the land and made a preliminary reconnaissance of the area, which is being followed by a detailed survey for the purpose of mapping and description.

TREE INTRODUCTION.

Prof. H. E. Gregory of Yale University, on arriving at Honolulu from Sydney, presented the Board with a dozen young trees of the Australian red cedar, *Cedrela australis*. This tree furnishes an excellent cabinet and furniture wood, and is extremely difficult to raise from seed. The trees, when a little larger, will be planted out in suitable places.

Among a consignment of seeds from the Agricultural Station near Tamatave, Madagascar, there were received in April three pods of the Gabon tulip tree, *Spathodea campanulata,* which is a favorite street tree in Ceylon. Only two specimens of this tree exist in Honolulu. One is in a corner of Mrs. Jaeger's yard on King street and bears beautiful crimson blossoms on its stately crown most of the year. Fortunately, the seeds from these pods are germinating well, and we hope soon to be in a position to distribute seedlings of this handsome tree for street and yard planting.

KAHOOLAWE.

From May 18 to 22 I was on the Island of Kahoolawe making an inspection of conditions and directing a goat hunt and drive. Weather conditions since last fall had been such that it was impossible to visit the island before this date with safety. I found the vegetation in the nature of pili and other grasses, ilima and other weeds, and algaroba trees greatly benefited by the winter rains. The cisterns were full of water, and both the natural reservoirs near the summit of the island and many of the gulches contained muddy water. A large part of the top of the island is still bereft of soil and is as bare as ever, and its reclamation is impossible except at a very great expense, which does not seem advisable at present. The remainder of the island is well worth improving, however, and the first step in this is the extermination of all goats and sheep. While on this trip I sowed seed of pigeon pea and sweet clover from Tasmania in order to ascertain their ability to exist on the barer parts of the island. Near the summit of Kahoolawe there are several excellent situations where, in my opinion, trees will grow well and a start can be made in forming a windbreak. But on account of the abundance of goats, which we found in almost every part on the island, I believe it would be useless to go to the expense of planting a single tree until all wild stock is exterminated.

On May 20 Capt. A. L. C. Atkinson landed on the island with fourteen men, mostly of the National Guard. A goat hunt was instituted on that day and a goat drive on the following. Without much difficulty 140 goats were driven into the pen at the south end of the island, where some were slaughtered and the balance taken to Lahaina for meat. The total bag on this trip was 286 goats and two sheep. I estimate that there still remain about 700 goats and 150 sheep on the island.

Before any further steps are taken toward the reclamation of the island, I believe that every sheep and goat should be either removed or exterminated and that the Board should take the initiative in accomplishing this. Several more trips to the island will doubtless be necessary before this desired end is attained.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, June 15, 1916.

The Superintendent of Forestry, Board of Agriculture and Forestry, Honolulu, Hawaii.

DEAR SIR:—I herewith submit a report of the work done during the month of May, 1916:

Nursery.—Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	75	394	469
Gratis	100	299	399
	175	693	868

Collections.

Collections on account of plants sold amounted to	$ 9.85
Collections on account of seed sold amounted to	2.00
Rent of building, Nursery grounds, for February and March, 1916, at $35	70.00
	$81.85

Plantation Companies and Other Corporations.

The number of trees distributed under this heading amounted to 56,000 in seed boxes, 2600 in transplant boxes and 18 pot-grown; total, 58,618. We have orders on file for the following, to be delivered during the next five months: 200,000 plants in seed boxes and 5000 in transplant boxes.

Makiki Station.

Transplanting trees, mixing and sterilizing soil and repairing road constituted the principal work done during the month.

Honolulu Watershed Forest Reserve.

The work done on the section of the watershed in the neighborhood of Hering Valley and Round Top Hill consisted of the rooting out of the Caesapinia bonduc and hoeing the young trees recently planted. The ground where the C. bonduc is growing will have to be done over several times, as the seed will continue sprouting; also portions of the roots will send out sprouts and

attempt to grow again. All of the larger roots have been dug out, but there may be some small ones left unnoticed.

Advice and Assistance.

The writer has been called upon to make visits and otherwise give advice and assistance to people in and around the city as follows: Calls made, 9; advice by telephone, 11; advice given people calling, 15; advice by letter, 6; total, 41.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

Division of Entomology

REPORT FOR MARCH.

Honolulu, Hawaii, April 14, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit my report of the work performed by the Division of Entomology for the month of March, 1916, as follows:

During the month there arrived at the port of Honolulu 38 vessels, of which 27 carried vegetable matter.

Disposal.

	Lots.	Packages.
Passed as free from pests	1113	25,509
Fumigated	5	6
Burned	70	93
Total inspected	1188	25,608

Of these shipments 25,176 packages arrived as freight, 272 packages by mail and 160 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 23,846 bags of rice and 3261 bags of beans arrived from Japan and Oriental ports which, after a careful examination, were found free from pests.

PESTS INTERCEPTED.

Two thousand nine hundred and thirty-eight pieces of foreign baggage were examined during the month, mostly at the U. S. Immigration Station, and 50 lots of fruit and 7 lots of vegetables were confiscated and destroyed by burning. Twenty-five banana shoots from Singapore were destroyed as being prohibited from entry into the Territory under Rule VIII of the Board; 1 ornamental plant found in baggage and infested with Aleyrodes, was fumigated before delivery; 1 lot of citrus seeds from Portugal found in a package at the Post Office was destroyed; 2 flowering cherry trees found in the baggage of a Japanese immigrant were fumigated on account of scale insects (*Diaspis pentagona*), and after holding same for two weeks were destroyed by burning, as the owner failed to call for them. Two small plants were treated as above and all soil removed before delivery. One

citrus tree from Japan was destroyed by burning, it being prohibited by law to import any citrus plants into the United States or Territories from foreign countries.

One lot of Abies and cypress seed from India, consigned to Mr. J. F. Rock, collaborator of the U. S. Bureau of Plant Industry, was fumigated as a precautionary measure before delivery.

A box of soil which was sent from Fiji for analysis was refused entry here for such purpose. After consulting and advising the agents to have the soil analyzed on the mainland, they shipped the box to Vancouver, B. C.

On March 4 Mr. Fred Muir brought four packages of parasite material which were opened in my presence at the Planters' station. All soil and packing material was destroyed by burning.

BENEFICIAL INSECTS.

During the month of March the following parasites of fruit flies have been bred:

Tetrastichus giffardii	18,900
Diachasma fullawayi	325
Diachasma tryoni	259
Total bred	19,484

The following parasites, including those reared for horn, house and stable flies, were liberated in various localities on several islands:

Tetrastichus giffardii	14,600
Diachasma fullawayi	253
Diachasma tryoni	186
Opius humilis	12
African Spalangia	1,800
African hornfly parasite	1,100
Philippine Spalangia	1,800
Philippine Pteromalid	700
Total parasites liberated	20,451

During the month we were able to liberate 1447 mealybug parasites in various sections on Oahu.

HILO INSPECTION.

Brother M. Newell reports the arrival of twelve steamers at the port of Hilo, six of which brought vegetable matter, and the arrival of one sailing vessel, which brought lumber. The ship-

ments consisted of 227 lots and 3355 packages, which were found free from pests and disease and passed.

INTER-ISLAND INSPECTION.

Sixty-three steamers plying between the port of Honolulu and ports on the other islands were attended to during the month. The following shipments were passed as free from pests:

Taro	530	bags
Plants	72	packages
Vegetables	85	"
Total passed	687	"

The following packages were refused shipment, as they did not pass the regulations pertaining to soil and infestation:

Plants	6	packages
Fruit	14	"
Total refused shipment	20	"

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

REPORT FOR APRIL.

Honolulu, Hawaii, April 30, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit my report of the work performed by the Division of Entomology for the month of April, 1916, as follows:

During the month there arrived at the port of Honolulu 43 vessels, of which 21 carried vegetable matter.

Disposal.	Lots.	Parcels.
Passed as free from pests	937	24,273
Fumigated	8	47
Burned	39	48
Returned	6	6
Total inspected	990	24,374

Of these shipments, 24,032 packages arrived as freight, 171 packages by mail and 171 packages as baggage of passengers and

RICE AND BEAN SHIPMENTS.

During the month 31,505 bags of rice and 2216 bags of beans arrived from Japan and Oriental ports, which, after a careful examination, were found free from pests and allowed to land.

PESTS INTERCEPTED.

Approximately 1807 pieces of foreign baggage were examined during the month, and 28 packages of fruit and six packages of vegetables were found in the search. These were seized and destroyed by burning.

One package of tree seeds from Singapore, for Mr. J. F. Rock, collaborator of the Bureau of Plant Industry, was fumigated as a precautionary measure with carbon bisulphide before delivery.

One package of plants from Japan was taken in the baggage and was fumigated with hydrocyanic acid gas; all soil was removed from the roots. In this lot three plants were burned on account of showing borer work, but no borers were found; one plant had a bagworm attached, which was removed.

One lot of orange trees in baggage from Japan was destroyed under Quarantine Order No. 19 of the Federal Horticultural Board of Washington, D. C., as under this order no citrus plants are allowed entry into this Territory from foreign countries. A bunch of bananas from the West Indies, via Canal Zone, arrived on the transport Sheridan, and was ordered back on board the ship, on its way to Manila.

A dozen sprouting cocoanuts arrived by the Luka from Fanning Island, and were fumigated as a precautionary measure before delivery.

One package of tree seeds, one package of pine cones, two packages of plant roots, all from Japan, and one package of coco beans from Trinidad, arrived in the mail and were returned to sender, as being unmailable under Federal Horticultural Board regulations.

Three cases of parasite material arrived during the month, consigned to the H. S. P. A., and were carefully examined at their station in the presence of the inspector. All soil and packing of these shipments was burned, as usual.

BENEFICIAL INSECTS.

During the month of April the following parasites of fruit flies have been bred:

Tetrastichus giffardianus	19,300
Diachasma fullawayi	697
Diachasma tryoni	468
	20,465

The following parasites, including those reared for horn, house and stable flies, were liberated in various localities on this and other islands:

Tetrastichus giffardianus	12,600
Diachasma fullawayi	427
Diachasma tryoni	299
African Spalangia	1,900
African hornfly parasite	1,300
Philippine Spalangia	1,600
Philippine Pteromalid	800
Total parasites liberated	18,926

HILO INSPECTION.

Brother M. Newell reports the arrival of eight steamers and three sailing vessels. Five steamers brought vegetable matter, consisting of 157 lots and 1932 parcels. All were passed as free from pests except four bags of turnips, which had to be cleaned from earth before delivery; also one package of gladiolus bulbs, which was fumigated on account of Aphis.

The Kiyo Maru arrived direct from Japan, bringing 3550 bags of rice and 335 bags of beans, all of which were found free from pests.

INTER-ISLAND INSPECTION.

Fifty-eight steamers plying between the port of Honolulu and other Island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	549 bags
Plants	89 packages
Vegetables	108 packages
Fruit	8 packages
Total passed	754

The following packages were refused shipment, as they did not pass the regulations pertaining to soil and infestations:

Plants	8 packages
Fruit	6 packages
Total shipments refused	14 packages

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

REPORT FOR MAY.

Honolulu, Hawaii, June 5, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

Gentlemen:—I respectfully submit my report of the work done by the Division of Entomology for the month of May, 1916, as follows:

During the month there arrived at the port of Honolulu 62 vessels, of which 27 carried vegetable matter and one vessel moulding sand. Of these vessels, 14 passed through the Panama Canal and called here for coal or provisions.

Disposal.	Lots.	Parcels.
Passed as free from pests	1253	20,039
Fumigated	9	282
Burned	71	71
Returned	2	2
Total inspected	1335	20,394

Of these shipments 19,972 packages arrived as freight, 232 packages by mail and 190 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 31,505 bags of rice arrived from Japan and 3645 bags of beans from Japan and Oriental ports, which, after a careful examination, were found free from pests and allowed to land.

Pests Intercepted.

Approximately 3934 pieces of foreign baggage were examined during the month, and 23 lots of fruit and 43 lots of vegetables were found in the search. These were seized and destroyed by burning.

A larva of the orchid beetle, *Acytheopeus aterrimus*, was taken in the stem of a *phalaenopsis* orchid in a shipment of these from Manila. The whole shipment was fumigated with hydrocyanic

acid gas before delivery. A plant brought by Mr. Fullaway for use in caring for the melon fly parasites en route, was destroyed upon arrival as no further use was to be made of it.

In a shipment of plants arriving from Philadelphia by Wells, Fargo & Co. Express, we found a buxus infested with a green psyllid, an ixora infested with the thread scale, *Ischnaspis longirostris,* and a small pandanus with mealybugs (*Pseudococcus longispinus*).

A passenger brought an ornamental garden in which a small pine tree was infested with the pine tree aphis (*Chermes* species). The garden was thoroughly fumigated before delivery.

A package of bulbs from Canada was returned by the Post Office as unmailable under ruling of the Federal Horticultural Board.

Three lots of parasite material arrived during the month consigned to the H. S. P. A. The shipments were opened at the Station in my presence. All soil and packing of these shipments has been burned as usual.

BENEFICIAL INSECTS.

During the month of May the following parasites of fruitflies have been bred:

Tetrastichus giffardianus	23,900
Diachasma fullawayi	694
Diachasma tryoni	681
Total	25,275

The following parasites, including those reared for horn, house and stable flies, were liberated in various localities on this and other islands:

Tetrastichus giffardianus	19,000
Diachasma fullawayi	708
Diachasma tryoni	644
African Spalangia	400
African hornfly parasite	1,000
Philippine Spalangia	300
Philippine Pteromalid	800
Total parasites liberated	22,852

Two hundred and seventy-eight parasites (*Paraleptomastix abnormis*) were liberated in various localities.

Mr. Fullaway returned from Manila with a supply of parasites of the melon fly. This species, *Opius fletcheris,* resembles the opius attacking the Mediterranean fruit fly. Mr. Fullaway's

time since his return has been occupied in breeding the parasites, and he has been able to liberate a small colony in the Kona district, where the bitter Chinese cucumber is growing wild in the open pasture lands and offered an exceptional place for liberation. He has been very successful in rearing a strong lot of parasites since his arrival here, and no doubt will shortly be able to liberate a few colonies in very favorable localities.

HILO INSPECTION.

Brother Matthias Newell reports the arrival of eight steamers, of which six carried vegetable matter consisting of 143 lots and 2103 packages. All these shipments were passed as free from pests.

INTER-ISLAND INSPECTION.

Sixty-three steamers plying between the port of Honolulu and other Island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	476	bags
Plants	184	packages
Vegetables	131	packages
Fruit	16	packages
Total passed	807	packages

The following packages were refused shipment, as they did not pass the regulations pertaining to soil and infestations:

Fruit	8	packages
Plants	7	packages
Total shipments refused	16	packages

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

Division of Animal Industry

Honolulu, Hawaii, May 1, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I beg to report for the Division of Animal Industry for the month of March, as follows:

ANNUAL REPORT.

A concise annual report, as by law required, is herewith submitted. It covers, as usual, the work of the various branches of this division, comparing results with those of the preceding years.

HOG CHOLERA.

A few cases of hog cholera were reported from Haleiwa, Mills Institute and Kapahulu. All were serum treated with good results. At Mills Institute the serum virus treatment was used, the virus being obtained by cutting off the tail of one very sick sow, which afterwards died.

SOREHEAD IN CHICKENS.

With the approach of warm weather, the demand for sorehead vaccine has been steadily increasing. This treatment continues to give good results. On March 20, while visiting Maui, a demonstration of the preparation and application of the vaccine was made at Haiku, where Mr. Krauss, of the federal Experiment Station's local branch, had called together many of the poultry raisers of that district. It was learned here that out of all chickens hatched after May, ninety per cent die from sorehead. Under these conditions an effective treatment and prevention such as afforded by the vaccination method caused many discouraged poultry raisers, who had practically abandoned the business, to take new hope, and several asserted they would raise one thousand chickens annually if sorehead can be kept in check by means of the vaccine.

In Honolulu the disease at the present time seems to be most prevalent among pigeons, the squabs being very susceptible to the disease. An outbreak of sorehead in a squab-raising establishment is further aggravated by the fact that the mother birds soon abandon the young ones when the sores on the head become at all emphasized, and especially if diphtheritic exudate occurs in the mouth or throat. The older birds seem to be almost immune to the disease—at least up to the present time—

though it is feared that later in the season they may also become affected.

In the meantime every effort will be made to acquaint poultry-raisers with the vaccine treatment and encourage them to give it a trial. Cheap and simple vaccinating outfits are now being prepared for distribution, and the deputy territorial veterinarians will be instructed to assist in the work by demonstrating the use of utensils and syringe.

GLANDERS ON HAWAII.

Two more cases of glanders have occurred in the Kohala district. They were reported by the local veterinarian, Dr. Rowat, and confirmed by Dr. Elliot. Both were destroyed and the premises disinfected. In case any more outbreaks should occur a thorough investigation will be recommended, with the rounding up of all horse stock in the district, and the mallein testing of all exposed and suspicious animals.

COUNTY FAIR ON MAUI.

Pursuant to official instructions, I left Honolulu March 15th in order to attend a meeting of the Maui Chamber of Commerce at Wailuku, convened for the purpose of considering the holding of a county fair, some time this summer or early fall.

The meeting was, by popular vote, changed from being one of the Chamber of Commerce to a citizens' meeting, and when called upon by the presiding officer, I outlined the success which had attended the county fair held at Hilo the preceding year, and strongly advised the Maui citizens to get together for the same purpose. The meeting then organized and appointed an executive committee with full power to act in all matters pertaining to the holding of such a fair, the time and place to be decided upon later. In accordance with my instructions, the committee was assured of every assistance which the various divisions of the Board of Agriculture and Forestry might be able to render toward making the fair a success, both in so far as exhibits, lectures and demonstrations were concerned. The meeting will be primarily one of agriculture, livestock and poultry, and will probably be held conjointly at Kahului and Wailuku, during the first part of September next.

TUBERCULOSIS CONTROL WORK.

The 817 head of dairy cattle reported tested by Dr. Case, during the month, with only nine reactors, would be satisfactory in itself, but becomes more so when it is considered that seven of the reactors occurred in a herd of 188 head of range cows that hitherto had been but indifferently attended to by its manager,

in so far as tuberculosis eradication is concerned. This leaves but two reactors among 638 bona fide dairy cows, belonging to eight owners, which must be called a handsome result.

The deputies on Hawaii, Maui and Kauai all report on tuberculin testing in coöperation with the local Board of Health agents in their respective districts, the sum total being that bovine tuberculosis is not by far as prevalent on the other islands as it is on Oahu.

Respectfully submitted,

VICTOR A. NÖRGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT TERRITORIAL VETERINARIAN.

Honolulu, Hawaii, April 7, 1916.

Dr. Victor A. Nörgaard, Chief of Division of Animal Industry, Board of Agriculture and Forestry, Honolulu, T. H.

SIR:—I beg to make the following report for March, 1916:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	Tested.	Passed.	Condemned.
W. E. Bellina	448	447	1
W. G. Hall	3	3	0
A. N. Campbell.....	2	2	0
Walter Love	30	30	0
Chas. Lucas	144	143	1
J. Andrade	1	1	0
J. H. Cummings	8	8	0
C. H. Cooke	2	2	0
Waianae Ranch	188	181	7

From the above it will be seen that a total of 826 head of cattle were tested, out of which number 817 were passed and nine condemned and branded.

Besides the above, twelve head of cattle were injected at the Leahi Home, the results of which will appear in the April report.

Importations of Livestock.

S. S. China, Orient—1 monkey, A. Lambert.

S. S. Lurline, San Francisco—1 stallion, 1 dog, 2 cts. live quail, 2 cts. white leghorns, W. F. Ex. Co.; 1 polo pony, Lieutenant Haverkamp; 20 mules, Honolulu Plant. Co.; 60 mules, Schuman Carriage Co.; 3 Hereford bulls, 1 Berkshire boar, F. W. Carter; 21 cts. poultry, various.

S. S. Tenyo Maru, Orient—1 dog, 1 monkey, Dr. E. Waterhouse; 1 dog, Miss Souther.

S. S. Wilhelmina, San Francisco—19 cts. poultry, various; 1 ct. rabbits, 1 dog, W. F. Ex. Co.

S. S. Manoa, San Francisco—34 cts. poultry, various.

S. S. Hokai Maru, Orient—1 dog, T. Ogawa.

S. S. Matsonia, San Francisco—31 cts. poultry, various.

S. S. Great Northern, San Francisco—1 dog, R. Courtney; 41 cts. poultry, Terr. Market Div.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

REPORT FOR APRIL.

Honolulu, Hawaii, June 19, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I beg to submit the following report of the Division of Animal Industry for the month of April, 1916:

SOREHEAD OR CHICKEN POX.

A series of experiments was undertaken during the past month for the purpose of evolving a more satisfactory method of preparing sorehead vaccine than the present one. For this purpose a dozen individual chicken coops were obtained, and through the courtesy of the Territorial Marketing Division a flock of fifteen White Leghorn cockerels, badly affected with sorehead, were secured.

To detail in this report the various experiments and their results would be to anticipate the publication of what promises to prove a complete new method of dealing with this disease, and which it is desired to perfect and secure the credit for before other investigators get news of the idea and "beat us to it."

In the meantime many applications for vaccine are being received and great difficulty is met with in obtaining scabs with which to prepare the vaccine, as there is little inclination among the poultry raisers to allow the disease to progress to the scab-producing stage if they can get vaccine to stop it with. We have, therefore, felt constrained to allow the cockerels above mentioned to remain untreated in order to obtain a quantity of crusts or scabs with which to work, and with the result that two have died already. On the other hand, several hundred head of exposed chickens have been vaccinated before reaching the fatal stage and a goodly percentage undoubtedly saved.

Young turkeys especially respond well to the treatment, and several flocks out of which the owners did not expect to save a single bird, have been treated without loss. Squabs and young pigeons are more difficult to deal with and do not respond as well or as quickly to the treatment as the turkeys.

From Hawaii and Maui the deputy territorial veterinarians report that it takes all their spare time and evenings to prepare vaccine and inject it, but agree that the work is well worth while on account of the good results obtained and the satisfaction it causes their clients.

GLANDERS ON HAWAII.

Dr. A. R. Rowat, whose application for appointment as deputy territorial veterinarian for the Kohala and Kona districts, on Hawaii, is before the Board, has reported one more case of glanders, and his appointment is urgently recommended.

The districts referred to are the only ones where this division has never had a representative, and it seems but natural that any glanders infection left on that island should make its appearance there. When to this is added that a great many dairy cows will have to be tuberculin tested in the near future, scattered over a district nearly one hundred miles long, from the Hamakua to the Kau line, it becomes manifest that the deputy in Hilo cannot possibly attend to the whole island any longer.

Respectfully submitted,

VICTOR A. NÖRGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT TERRITORIAL VETERINARIAN.

Honolulu, Hawaii, May 19, 1916.

Dr. Victor A. Nörgaard, Chief of Division of Animal Industry, Board of Agriculture and Forestry, Honolulu, Hawaii.

SIR:—I beg to submit the following report for the month of April, 1916:

Tuberculosis Control.

The following dairies were tested during the month:

	Tested.	Passed.	Condemned.
Leahi Home	12	12	0
S. I. Shaw	43	37	6
J. W. McGuire	7	7	0
V. Souza	3	3	0
S. T. Grace	2	2	0
Catpain Heartman	2	2	0
E. W. Williamson	3	3	0
M. T. Brazon	34	33	1
M. M. Pedro	16	15	1
F. Fugito	7	7	0
Nishimoto	17	17	0
John Alias	14	14	0
John Simo	15	15	0
Wm. Medeiros	5	5	0
A. Shinado	14	13	1
R. A. Franco	18	18	0
A. Pacheco	28	28	0
J. A. Costa	5	5	0
K. Yamashita	65	62	3
S. Hiarata	30	30	0
M. K. Young	40	40	0

From the above list it will be seen that a total of 380 were tested, out of which number 378 were passed and tagged and 12 condemned and branded. At the present time only one of the condemned remains alive, and that one will be slaughtered within a month. More than half of the above condemned animals were tested for the first time this year.

Chicken Pox.

During the month 1135 cc. of chicken pox vaccine was prepared and distributed among different poultry raisers. This amount was sufficient for the double treatment of over 560 fowls.

Importations of Livestock.

S. S. Lurline, San Francisco—8 mules, A. W. Eames; 46 mules, Schuman Carriage Co.; 16 mules, H. Hackfeld & Co.; 1 Hampshire sow, W. F. Express Co.; 1 Polan China boar, Haw. Com. & Sugar Co.; 2 Devon bulls, Amer. Sugar Co. (Molokai Ranch); 37 cts. poultry.

S. S. Wilhelmina, San Francisco—39 cts. poultry.

S. S. Manoa, San Francisco—34 cts. poultry, 1 ct. rabbits, W. F. Express Co.

S. S. Matsonia, San Francisco—29 cts. poultry, 2 cts. rabbits, W. F. Express Co.

S. S. Niagara, Sydney—1 Pekinese spaniel, Mrs. Hugh D. McIntosh.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

REPORT FOR MAY.

Honolulu, Hawaii, June 17, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I beg to submit herewith my report for the Division of Animal Industry for the month of May, 1916:

HOG CHOLERA.

Two outbreaks, presumably, of hog cholera occurred on Oahu during the past month. In the first case, at Waipio, a litter of young pigs were lost, malicious poisoning being suspected on account of threats made by a discharged Oriental employe. A post-mortem examination of two pigs indicated hog cholera, but did not establish a definite diagnosis. The mother sow was very sick at the time, and four other grown hogs were more or less unthrifty. Anti-hog cholera serum was applied to all the animals, and while none of the remaining young pigs recovered, all of the grown hogs were greatly benefited and ultimately recovered. The mother sow had a relapse and received a second large injection, after which she made a complete recovery.

The second outbreak, at Honouliuli, involved a much larger number of hogs, or in the neighborhood of sixty. These were also given the serum treatment with highly satisfactory results. Only two shoats were lost, while some very remarkable recoveries were observed.

KIDNEY WORM IN HOGS.

From Hawaii Dr. Elliot reports an extensive outbreak of this disease among a large flock of hogs being fed butcher offal at a slaughter house some eight miles from Hilo. Weakness in the hand quarters with ultimate paralysis are the principal symptoms.

Owing to the large mortality—fifty had died out of sixty—hog cholera was also suspected, and the surviving ten head were serum treated. Dr. Elliot also reports the sanitary conditions at the place as very bad, and adds that a neighboring hog raiser lost his entire herd under similar conditions a short while ago.

While kidney worms have been observed on Oahu a number of

times in hogs that have died from cholera, no such infestation as that described by Dr. Elliot has ever been met with here.

A hog raiser from Kona, Hawaii, recently brought to this office the carcass of a pig which upon examination was found badly affected with these same parasites, indicating that the disease is widely scattered on the Island of Hawaii. Government reports show the disease to be common in the Philippine Islands, but fail to recommend any measures for relief beyond improved sanitary conditions.

SOREHEAD IN CHICKENS.

A number of outbreaks of this disease have been reported, and all have been treated with vaccine. In order to obtain scabs for these several hundred head exposed birds with but few affected, the 15 Leghorn cockerels obtained from the Territorial Marketing Division were allowed to remain untreated. Four of these died, but sufficient scabs were obtained from the flock to treat more than a thousand birds, and thereby prevent or obviate the necessity of letting the disease progress in a number of infected flocks until scabs appeared in sufficient quantities for autogenous treatment.

This method of purchasing fowls from which to obtain virus scabs is now followed by the University of California Experiment Station, and will undoubtedly have to be adopted here if an attempt at eradicating the disease is to be made. As most of the fowls used for this purpose can be saved, the cost will be insignificant as compared to the benefit the poultry industry will reap therefrom.

BOVINE TUBERCULOSIS WORK.

The testing proceeds as usual, as is reported on fully in the appended reports of the Assistant Territorial Veterinarian, in so far as Oahu is concerned. From the other islands all of the deputies report progress and coöperation with the Board of Health sanitary inspectors. In this connection I beg to call attention to my letter of the 8th inst. recommending that the said deputies be subsidized by the Board of Health the same as this office is subsidized by the local Board of Supervisors, for enforcing the respective milk ordinance and sanitary code of the said Boards. With the vast districts allotted to each deputy, and with the local laws requiring that all milch cows be tuberculin tested by a government veterinarian, it seems but reasonable that the deputies of this Board, who are the only officials that can undertake this work, be allowed at least their actual traveling expenses when performing Board of Health work.

GLANDERS ON HAWAII.

This dangerous and destructive disease has again made its appearance on Hawaii, and in the only district in the Territory unprotected by a deputy territorial veterinarian—that is, Kohala. Not less than four outbreaks with six cases have been reported, and considerable apprehension is felt by plantation and ranch managers in that district. It is therefore strongly recommended that an additional deputy territorial veterinarian be provided for this district, and that the application of Dr. A. R. Rowat for this position be favorably acted upon. Dr. Rowat is now practising in Kohala, and to him is due the credit for apprehending and reporting the cases of glanders referred to.

Respectfully submitted,

VICTOR A. NÖRGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT TERRITORIAL VETERINARIAN.

Honolulu, Hawaii, June 9, 1916.

Dr. Victor A. Nörgaard, Chief of Division of Animal Industry, Board of Agriculture and Forestry, Honolulu.

SIR:—I have the honor to submit the following report for the month of May:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	Tested.	Passed.	Condemned.
S. Okuma	7	7	0
Wm. Meyer	5	3	2
W. E. Wau	4	4	0
Waialae Ranch	432	412	20

From the above tabulated list it will be seen that a total of 448 head of dairy cattle were tested, out of which number 426 were passed and 22 condemned and branded.

It was not expected that so many animals would be found diseased at the Waialae Ranch, but in every instance where we were able to make a post-mortem examination, the correctness of the intradermal test was demonstrated, and also the fact that all lesions were of recent origin, showing beyond doubt that the infection is still present on the ranch in sufficient amount to cause considerable loss. There is little doubt that the centers of

infection are the old stanchions and feed boxes, which it is next to impossible to disinfect satisfactorily and thoroughly.

Post-Mortem Examinations.

During the month a number of post-mortem examinations were made, the results of which are as follows:

Three cows condemned at K. Yamashita's dairy, April 29, 1916:

No. 1—Retropharyngeal glands and one prescapular gland affected.

No. 2—Small nodules in lung and mediastinal glands; two mesenteric glands and one portal gland.

No. 3—Retropharyngeal glands affected.

Two condemned cows slaughtered at the C. & L. Meat Co.'s abattoir:

No. 1—Large nodule in left lung; nodules in both bronchial and mediastinal glands.

No. 2—Old calcereous nodules in diaphragmatic lobe of left lung; recent nodules in diaphragmatic lobe of right lung and mediastinal glands.

Six condemned cows slaughtered at the Waialae abattoir:

No. 1—Numerous recent nodules in the mediastinal glands.

No. 2—Recent nodules in bronchial and mediastinal glands.

No. 3—Recent nodules in retropharyngeal glands.

No. 4—Bronchial and mediastinal glands affected; every evidence of recent infection.

No. 5—Bronchial and mediastinal glands and numerous nodules in both lungs.

No. 6—Recent nodules in mediastinal glands.

Besides the above, a few pathological specimens were received from the Metropolitan Meat Co.'s abattoir, taken from the lungs and costal and diaphragmatic pleurae of a Molokai steer. A diagnosis of tuberculosis was made, which was fully substantiated by a careful microscopical examination.

Hog Cholera.

During the past month two outbreaks of hog cholera were reported. The prompt application of anti-hog cholera serum cut the loss to practically nothing, as in one herd only three small pigs were lost and in the other two medium-sized ones died. A total of 58 hogs were injected. The advantages of the prompt injection of serum in herds in which the disease has made its appearance can hardly be overestimated.

Chicken-pox or Sorehead.

During the month 10.162 gms. of powdered virus of different strains has been prepared, and also 775 c.c. of vaccine made up

and used in infected flocks. The total number of birds injected by us is as follows: Chickens, 200; turkeys, 7; pigeons, 8.

Good results is the rule wherever the vaccine has been used, provided, however, the disease was reported before too far advanced.

Importations of Livestock.

S. S. Lurline, San Francisco—1 Guernsey bull, B. D. Bond; 1 horse, Dr. Walter Peck; 1 horse, Harold Castle; 8 mules, K. P., care Hackfeld & Co.; 46 mules, Schuman Car. Co.; 1 dog, W. F. Ex. (W. E. Wall); 34 cts. poultry. Kahului—3 horses, Angus McPhee; 3 horses, Maui Agric. Co.

S. S. Wilhelmina, San Francisco—1 dog, Lieutenant Herwig; 27 cts. poultry.

S. S. Manoa, San Francisco—1 dog, H. F. Damon; 32 cts. poultry.

S. S. Dix, Seattle—52 horses, Q. M. Dept.; 2 dogs, Captain Corey; 1 dog, Lieutenant Hoyte.

S. S. Matsonia, San Francisco—1 dog, R. W. Atkinson; 1 dog, T. Nickelson; 36 cts. poultry.

S. S. Tenyo Maru, Orient—14 cts. pheasants, E. H. Paris.

S. S. Sonoma, San Francisco—3 cts. poultry.

S. S. Lurline, San Francisco—1 stallion, A. W. Carter; 3 polo ponies, W. F. Dillingham; 12 mules, A. & B. (1 lost overboard); 26 mules, Schuman Car. Co.; 2 bulls (Shorthorn), S. M. Damon; 14 bulls (Hereford), Haleakala Ranch, Maui; 2 dogs, Sergeant Horbst; 1 Guernsey heifer, B. D. Bond; 67 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, April 18, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—The following report of operations of the Division of Hydrography during March, 1916, is submitted:

WEATHER CONDITIONS.

The rainfall during the month was generally light, except on Hawaii, and on all other islands streams and ditches are beginning to show depletion. Crops on portions of Kauai have begun to show the effects of dry weather.

WAIAHOLE TUNNEL DISCHARGE.

On March 20 fifteen million gallons per day were flowing from the south, or Waiawa, portal, and 1.8 million gallons per day from the north portal. Of the discharge at the south portal, five million gallons per day were flowing from the government end of the tunnel—making ten million gallons per day being developed in that part of the tunnel under Bishop Estate land and about seven million gallons per day in the government end of the tunnel.

On March 28 a Gurley continuous-record gaging station was established, at the expense of the Waiahole Water Company, in the tunnel at a point directly under the boundary between the government and Bishop Estate lands, about 1750 feet from the north portal.

A large chamber in which the instrument is sheltered has been excavated at this point and connection made by ladder to the old "R" tunnel which was originally driven to intercept ground water from the main tunnel, and which is now dry. "R" tunnel will be used as a means of ingress and egress to the station.

For about 100 feet above and 25 feet below the station, the tunnel has been lined with masonry and cement plastered to form a smooth rectangular section, through which the water will flow smoothly and without turbulence. A bridge has been built over the lower end of this section, from which velocity and cross-sectional area measurements will be made, while the water-stage recorder will keep a continuous record of surface fluctuations. The chamber will be lighted with two large gasoline lamps.

It is estimated that continuous records of the discharge at this point will be obtained within a limiting error of two per cent.

FEDERAL INSPECTION.

Mr. N. C. Grover, chief hydraulic engineer of the U. S. Geological Survey, arrived at Hilo on the S. S. Great Northern, March 12, and spent the remainder of the month inspecting the work in the Territory. Mr. Grover visited Kauai, Maui and Hawaii, as well as Oahu, and conferred with many local officials and water users.

OPERATION AND MAINTENANCE WORK.

Kauai. Several miles of mountain trails, which had been damaged by the December and January storms, were cleared and repaired. Minor repairs were made at the three new Waimea River stream-gaging stations, and the Wainiha River gaging station was enlarged, furnished and provisioned in order that it may be used as a camping place. Work was started on the repairing and enlargement of the Waioli River gaging station.

W. V. Hardy, assistant engineer, spent four days with N. C. Grover, chief hydraulic engineer of the U. S. Geological Survey, and G. K. Larrison, superintendent of hydrography, on an inspection trip around the island. W. V. Hardy spent twenty-two days in the field, during which he visited seventeen stream and two rain-gaging stations, and made twelve stream and ditch measurements at regular stations, and one miscellaneous stream measurement. He spent five days in the office on computations and general office work.

D. E. Horner, field assistant, spent twenty-eight days in the field and one day in the office. He visited sixteen stream and seven rain-gaging stations.

Oahu. A large amount of operation and maintenance work was done. All of the fifty-one stream and ditch-gaging stations were visited and twenty-four stream and ditch measurements were made at regular stations, and five miscellaneous stream measurements were made. Five rainfall-measurement stations were visited.

Maui. R. D. Klise spent fourteen days in the field, visited twenty-one stream and ditch and one rain-gaging stations, and made six stream and ditch measurements at regular stations. Repairs were made at the W. Wailuaiki and Hanawi stations which were damaged by January floods.

G. K. Larrison accompanied N. C. Grover, chief hydraulic engineer of the U. S. Geological Survey, on an inspection trip covering the last four days of the month, and visited twelve stream-measurement stations.

Hawaii. General conditions pertaining to stream flow and rainfall were investigated in connection with an inspection trip made around the island with N. C. Grover, chief hydraulic engineer, U. S. Geological Survey.

BIENNIAL REPORT.

The detailed biennial report for the period ending June 30, 1915, was completed except for some descriptive matter, and will be ready for the printer in the near future.

Stream and ditch discharge data and rainfall records are now available for distribution in blue print form to interested parties.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

REPORT FOR APRIL.

Honolulu, Hawaii, May 11, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

Gentlemen:—The following report of operations of the Division of Hydrography during April, 1916, is submitted:

WEATHER CONDITIONS.

The drought that began in March and which had begun to seriously affect crops in many localities was broken by the heavy rains during the last week of the month.

The first half of the month was very dry on all islands. During the week ending April 22, abundant rain fell in most districts in Hawaii, and in the Makawao and Hana districts of Maui.

All islands received a heavy rainfall during the last week of the month, and in many localities severe thunderstorms occurred.

FEDERAL INSPECTION.

Mr. N. C. Grover, chief hydraulic engineer, water resources branch, United States Geological Survey, completed his inspection of the work being done in the Islands and sailed for the mainland on April 4, 1916.

Mr. Grover made especial comment on the necessity of making definite plans for augmenting and safeguarding the water supply of the city of Honolulu, and of the necessity for intensive investigations looking toward the storage of flood waters for irrigation of semi-arid lands suitable for sugar cane but now lying idle on account of lack of water.

SPECIAL KAUAI WORK.

At the request of the Governor of Hawaii, the Superintendent of Hydrography accompanied His Excellency to Kauai to be

available in an advisory capacity relative to Territorial waters. Nine days were spent on the ground, and visits were made to the Waimea canyon, Kekaha, Kanaha, Kapahi, Lihue and Hanamaulu ditches, and the headwaters of the North Wailua, Kapaa and Anahola streams.

HILLEBRAND GLEN RUN-OFF.

At the request of the Governor of Hawaii, the construction of a weir and continuous record-measurement station to measure the run-off from Hillebrand Glen was started. This station will measure the water which might be diverted by the proposed ditch into Reservoir No. 4.

OPERATION AND MAINTENANCE.

Kauai. Several miles of trails in the North Wailua, Waioli and Wainiha valleys, which were badly blocked and damaged by the December and January storms, were cleared and repaired. The same operations were continued on the trails in the upper Kalihiwai and Hanalei valleys.

Repairs and improvements were made to the continuous-record stream-gaging stations on the Olokele, Anahola, Waioli and upper and lower Wainiha streams.

W. V. Hardy, assistant engineer, spent 20 days in the field, visited 22 stream and ditch-measurement stations, and made 21 measurements.

D. E. Horner, field assistant, spent 24 days in the field, visited nine stream and ditch measurement and seven rain-gaging stations, and made 12 measurements.

Oahu. Only routine operation and minor repair work was done.

Maui. Two new foot suspension bridges were rebuilt in the Waihee Stream in order that the stream-gaging station might be reached during floods. Seven staff gage stations which were destroyed by the December and January floods were re-established and minor repairs were made at several stream and ditch-gaging stations. Twenty-nine stream and ditch-gaging and one rain-gaging stations were visited and 22 measurements were made.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

REPORT FOR MAY.

Honolulu, Hawaii, June 9, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—The following report of operations of the Division of Hydrography during May, 1916, is submitted:

WEATHER CONDITIONS.

Rainfall was plentiful generally over all of the islands during the month. Heavy floods occurred on East Maui and parts of Hawaii during the early part of the month, but generally the rain fell in light but abundant showers.

The rainfall measurement station on Mt. Waialeale, elevation 5075 feet, on Kauai, which was reëstablished on May 21, 1915, was visited on May 21st, and the complete record for the year showed a total of 561 inches of rainfall.

BIENNIAL REPORT.

The biennial report, containing all detailed data collected during the period ending June 30, 1915, was sent to the Washington, D. C., office of the U. S. Geological Survey to be printed. It is estimated that about one year will elapse before this printed report is distributed. In the meantime copies of data for any particular locality may be had free of charge by applying to this office for the same.

HILLEBRAND GLEN RUN-OFF.

The installation of a weir and continuous-record measurement station on the Maole Stream in Hillebrand Glen was completed and discharge records are now available. Two U. S. Weather Bureau rain gages were established in the valley, above the station, and daily and weekly records are being obtained therefrom.

OPERATION AND MAINTENANCE.

Kauai. The clearing and repair work in the upper Hanalei and Kalihiwai trails were completed. All mountain trails on Kauai, with the exception of the upper Lumahai Valley trail, are now in good condition. The stream beds and cross-sections at the upper Hanalei and Kalihiwai stations were also improved.

Twenty-nine stream and ditch-measurement stations and thirteen measurement stations were visited. Thirty-nine stream and ditch measurements were made.

Oahu. Only routine operation and maintenance work was done. Forty-three ditch and stream-measurement stations were visited and 23 measurements were made. Records were obtained from four rainfall-measurement stations.

Maui. A considerable amount of improvement work was done on the Ukumehame, Lahainaluna, and several small East Maui stream-measurement stations. Twenty-three stream measurements were visited and 14 measurements made. One rainfall-measurement station was visited.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF HONOLULU, ISLAND OF OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, and of every other power me hereunto enabling, I, Lucius E. Pinkham, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said laws provided, do hereby set apart as a forest reserve to be called the MANOA RANGER STATION, subject to existing rights, a portion of that certain piece of government land called Kahoiwai, in Manoa Valley, District of Honolulu, County of Honolulu, Island of Oahu, Territory of Hawaii, containing an area of 15.36 acres, more or less, more particularly described by and on maps made by the Government survey department of the Territory of Hawaii, which said maps are now on file in the said survey department marked Government Survey Reg. Map No. 1622, and "Manoa Ranger Station," and a description accompanying the same numbered C. S. F. No. 2627, which said description now on file in said survey department is as follows:

MANOA RANGER STATION.

Portion of the Government Land of Kahoiwai, Manoa Valley, Honolulu, Oahu. C. S. F. No. 2627.

Beginning at the Government Survey Trig. Station "Puu Pia" (marked by a galvanized iron pipe) at the South corner of this land and from which the true azimuth and distance to Government Survey Trig. Station "Akaka" is 37° 49′ 30″ 2633.1 feet, as shown on Government Survey Registered Map No. 1622, and running by true azimuths:

1. 129° 48′ 1181.5 feet along Grant 109 to Waiakoloa to a galvanized iron pipe near corner of fence;
2. 159° 26′ 282.5 feet along Government land;
3. 252° 30′ 210.5 feet along L. C. A. 1923, Apana 1, to Kekua to a pipe;
4. 242° 15′ 344.0 feet along L. C. A. 1923, Apana 1, to Kekua to a pipe;
5. 323° 25′ 1314.0 feet along Grant 163 to Kalama to a pipe at top of ridge;
6. 56° 03′ 339.0 feet along ridge dividing this from Kolowalu to the point of beginning.

Area, 15.36 acres.

In witness whereof, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol in Honolulu, this ninth day of May, A. D. 1916.

LUCIUS E. PINKHAM,
Governor of Hawaii.

(Seal)

By the Governor:
WADE WARREN THAYER,
Secretary of Hawaii.

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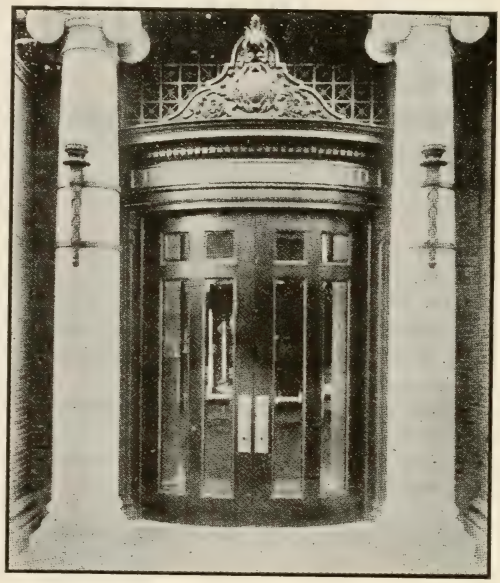
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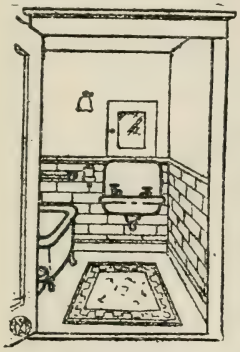
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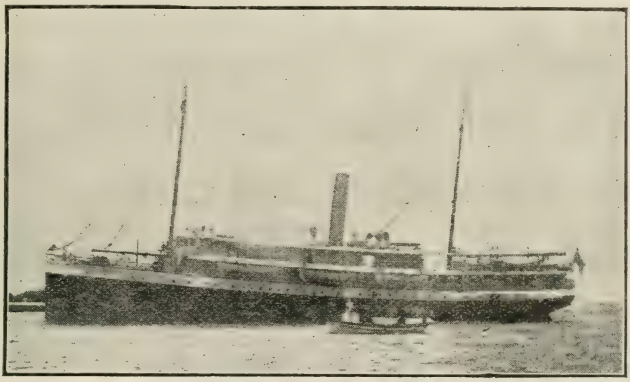
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THE HAWAIIAN FORESTER AND AGRICULTURIST

JULY, 1916

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Over 204,000 parasites of the Mediterranean fruit fly—consisting of six different species of beneficial, introduced insects—were liberated by the Division of Entomology during 1915 with very good results.

During the calendar year 1915 the Division of Entomology inspected 674 vessels and carefully went over 345,633 packages of vegetable matter for injurious insects and other pests, of which 32 genera and 28 species were discovered and prevented from becoming established in the Territory.

The natural parasites on the melon fly, introduced from India in May by Field Entomologist Fullaway, are multiplying very rapidly and the work of distribution has begun. By the end of this summer it is planned to have this parasite established on all the islands.

Division of Forestry

ANNUAL REPORT.

Honolulu, Hawaii, June 14, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I have the honor to submit the following brief report covering the work of the Division of Forestry for the calendar year 1915.

INTRODUCTION.

Soon after I began my duties as Superintendent of Forestry on January 16, 1915, it was evident that the most important work which lay before me was forest protection, and that the main way to secure this was by building suitable fence barriers to stock. It also appeared to me that the policy, established by the Board on the recommendation of my worthy predecessor, of forest extension and of coöperating with tree planters in the Territory by supplying seedlings at cost, was well founded, and consequently this has been continued as an important activity of the Division of Forestry under the able direction of the Forest Nurseryman.

During the year, the forest work has taken me to all of the eight islands of the group with the exception of Niihau and Lanai, where the government is not concerned with any forest reserves.

A variety of minor activities of the division, which are merely mentioned in this report, have occupied some time during the year as well as the legislative, financial, editorial and administrative duties which have fallen on my shoulders as executive officer of the Board.

FOREST PROTECTION.

Forest Fencing. Realizing the importance of forest protection by means of fencing to keep stock out of our susceptible native forests, this feature has received my chief attention throughout the year. The first move was to purchase out of the appropriation for the last biennial period, 100 miles of the best and most durable wire obtainable, which was the No. 6 gauge, special extra-heavy galvanized fence wire, enough wire for twenty miles of the standard five-wire fence which this division constructs. The wisdom of this purchase has since then been proven because, on account of the increased cost of spelter due to the war, the price of this wire has increased from $3.52 per coil of 100 pounds to $5 per coil.

My predecessor in 1912 estimated that 111 miles of private and 110 miles of government forest fences existed, that 21.5 miles of forest fences were required to be constructed by government leases, and that 91 miles of private forest land boundaries and 85 miles of government forest reserve boundaries were in need of fences for the better protection of the native forest. Since then many miles of fences have been built under lease requirements.

The Division of Forestry first began fence building on forest reserve boundaries in July, 1910, and from that date to November 14, 1914, which was previous to my coming into office, or during a period of a little more than four years, had constructed 11.52 miles of such fences at an average cost of $401.56 per mile. This cost may appear excessive, but it must be remembered that most of these fences are in remote and rather inaccessible localities where the cost of getting the material on to the ground is very great.

Owing to the necessity of visiting the localities where fencing was needed in order to prepare specifications in a businesslike manner, the actual work of fence construction in 1915 did not begin until the summer months. But before the year was up 2.85 miles of new fence had been constructed at an average cost of $428.47 per mile, and 3.54 miles of old and broken fences repaired, making a total of 6.39 miles of forest boundary effectively guarded from destructive stock. It should be borne in mind that the maintenance of existing fences is as important as the construction of new ones, because an old fence with breaks in it is just as ineffective against stock as no fence at all. Conversely, a broken fence repaired and put in good shape is as valuable as a stock-barrier as a new fence, and is usually made effective at a lesser expense than a new fence. Contracts have been let and plans are being made for the construction of new fences and the repairing of existing fences during 1916, which will amount to a great many more miles.

The standard fence of the Division of Forestry consists of 5 smooth galvanized wires stretched on 7-foot redwood posts set 2 feet in the ground, 20 feet apart with 2 intermediate Douglas fir spreaders. This, of course, has to be varied in places on account of topography and for other reasons.

Administration. Added protection has been given to the forest reserves by the appointment during the year of three new Forest Rangers, one on Kauai and two on Oahu, whose duty it is to patrol government lands in the reserve to prevent forest fires, damage by stock and trespass, to maintain existing fences and, when necessary, construct new ones, and to plant trees. Additional rangers will be appointed where the need for them is real and when suitable men, who are trustworthy and will work conscientiously without close supervision, can be found.

Forest Fires. The volunteer District Fire Wardens have continued to do effective service in suppressing forest and grass fires throughout the Territory. During 1915 there were eight of such fires, but only one of them, at Kapahi, Kauai, did any appreciable damage to the native forest. During late August and early September the prolonged dry season and strong winds made the fire situation in the region of Schofield Barracks, Oahu, rather critical. There were five fires on the east slope of the Waianae Mountains at about this time, and troops from the barracks and laborers from the pineapple fields did splendid work in finally extinguishing them. None of these fires burned for more than five days.

New Forest Reserves. Although the larger tracts of forest lands belonging to the Territory have been placed in forest reserves, and now total 546,222 acres, there still remain some smaller areas of land more suitable for forest than for any other purposes, which should be set apart as forest reserves. Several of these have been investigated during the year, and as soon as technical descriptions have been received from the Government Surveyor they will be recommended as new reserves to be set apart by the Governor.

FOREST EXTENSION.

Tree Distribution. The Division of Forestry has continued to encourage tree planting in the Territory by raising and distributing tree-seedlings at cost. Where the planting is of a public nature the trees are supplied without charge. Under this arrangement, a total of almost a quarter of a million trees were distributed for planting during the year 1915 from the government nursery at Honolulu and from the subnurseries at Hilo, Hawaii, and Homestead, Kauai. The actual number of trees so distributed was 247,432, which is 50,000 more than in 1914. Of this amount 62 per cent. was received by sugar plantation and ranch companies interested in tree planting, and almost half of the trees consisted of swamp mahogany, *Eucalyptus robusta*, which indicates the present popularity of this fast growing Australian gum tree. Of this number of trees, 21,248 were distributed for planting on Arbor Day, which was fittingly celebrated on November 19. This number has been exceeded only on two previous Arbor Days. On this occasion 1,350 school children called at the government nursery and each took one tree away for planting.

Most of the seed for propagating these trees was collected locally by two seed boys, who are kept constantly on the job. An instance of the economy of this method of securing seed is shown by the gathering on Tantalus from one tree in one day of 1½ pounds of seed of the lemon-scented gum, which formerly had to be purchased from California for $32.00 per pound.

Tree Planting. From reports that have reached this office, a

total of 874,489 trees were planted throughout the Territory during the year, although the number actually planted was probably nearer one million. This reported number, however, is greater than the average for the past seven years for which records have been kept. Of this number, 86 per cent. was planted out by sugar plantation companies which have begun to realize the necessity of establishing a cheaper fuel supply for domestic purposes. An analysis of the reports on trees planted during the year shows that, as the main purpose of planting, 53 per cent. was planted for fuel, 32 per cent. for watershed cover, 8 per cent. for windbreaks, 5 per cent. for timber, and 2 per cent. for ornament. Of the species planted, swamp mahogany, *Eucalyptus robusta*, heads the list at 52 per cent.; followed by assorted species (too numerous to mention) 17 per cent.; ironwood, *Casuarina equisetifolia*, 14 per cent.; blue gum, *Eucalyptus globulus*, 9 per cent.; lemon-scented gum, *Eucalyptus citriodora*, 5 per cent.; algaroba, *Prosopis juliflora*, 1.5 per cent.; and silk oak, *Grevillea robusta*, 1.5 per cent.

The Division of Forestry has continued the tree planting of native species on the Honolulu watershed in the Makiki Valleys, and during the year set out 5,841 kukui and 1,525 koa, or a total of 7,366 trees. This, with the trees previously planted in this region, brings the total up to 14,593 trees, which now cover a little over 75 acres. The trees on the whole are growing rapidly and well, and promise soon to form a very beneficial protection to this area. Some of the koa trees on Sugar Loaf, only two years old, are already 14 feet high and 4 inches in diameter.

MISCELLANEOUS.

Along with administrative duties, a portion of my time has been spent in the endeavor to clear the status of certain lands in forest reserves in which the Attorney General's and Survey Departments of the Territory have kindly coöperated.

The experimental issuance of a permit to gather mature awa root on certain forest reserves on the island of Hawaii, has disclosed the interesting fact that very little of this commodity exists on government lands in the forest reserves and that it is in such inaccessible places that it is not profitable to gather it.

An effort has been made during the year to inspire interest in the raising of willows for the manufacture of wicker furniture, by exhibiting a handsome settee made from rods of the yellow willow, *Salix vitellina*, grown at the Makiki nursery. The possibilities of this industry in the Territory are not realized by many.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry and Chief Fire Warden.

REPORT FOR JUNE.

Honolulu, Hawaii, July 17, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of June, 1916:

The survey of the proposed new forest reserve on the north slope of the Waianae Mountains back of Waialua and Mokuleia was completed during the month and includes a total area of 6,650 acres, 95% of which is government land. Some additional data must first be obtained before the project of creating this area as a forest reserve can be submitted to you for approval.

Sufficient wire was hauled up to the forest reserve boundary in Waiomao Valley, Palolo, preliminary to the construction of a stretch of 2,000 feet of fence which will be built in coöperation with the adjacent owner to protect the forest and watershed in that region.

One day was spent along the Nuuanu Valley road within the Honolulu Watershed Forest Reserve posting signs, cutting down dead trees, and pulling up golden rod plants which had begun to run wild in a few places.

The repairing of the Lualualei Forest Reserve boundary fence for a distance of 6.65 miles was completed during the month and all cattle driven from the reserve. On a stretch of 1.12 miles, a new fence, necessary for the protection of one end of the reserve, is now being constructed and will be completed within a month.

On June 6 and 7, I visited forest reserve lands in the region of Lualualei and Makua and, in company with Superintendent G. K. Larrison, investigated two water projects and forest fencing required by a Land Office lease. Copies of our reports on these matters to the Land Commissioner are herewith attached.

During the month tree planting on the Kamalomalo flats within the Kealia Forest Reserve, Kauai, was begun by Forest Ranger Lovell. The object of planting is fuel production and water conservation and the preliminary planting just inside the forest boundary is in the nature of a windbreak.

The first arrest and conviction under Rule II of the Division of Forestry, occurred in May when Paul Topeka and two other Russians were apprehended for hunting on the Mauna Kea Forest Reserve, Hawaii, without a permit. In the District Court of Hamakua they were convicted and each paid a fine of $50.00 and costs amounting to $3.30.

The land proposed to be set aside as the Round Top Forest Reserve was examined and a special report on the project has already been placed in your hands.

The survey and mapping of the land in the region of Piha within the Hilo Forest Reserve has been completed, and I am obtaining data on the cost of fencing about 4.50 miles of forest land boundaries, in coöperation with adjacent owners, before submitting a detailed report to the Board on the project.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, July 18, 1916.

Superintendent of Forestry,
Board of Commissioners of Agriculture and Forestry,
Honolulu.

DEAR SIR:—I herewith submit a report of the work done during the month of June:

Nursery.

Distribution of Plants.

	In boxes transplanted	Pot grown	Total
Sold	400	210	610
Gratis	700	2071	2771
Totals	1100	2281	3381

Collections.

Realizations.

Collections on account of plants sold amounted to	$ 9.35
Rent of Office Building Nursery Grounds	35.00
	$44.35

Preservation Forest Reserves.

Rent of premises at Half-Way House, Tantalus, for April, May and June at $10.00 per month	$30.00
Fee for use of land and gathering ti leaf on Kalawahine, Pauoa Valley, at $50.00 per year, 3 months	12.50
For use of two acres of land Kalawahine, Pauoa Valley, at $20.00 per year, April, May and June	5.00
One load black sand from Makiki Valley	.25
Rent of small piece of land Pauoa Valley, 3 months	.75
	$48.50

Plantation Companies and Other Corporations.

The number of trees distributed under this heading amounted to 6,000 in seed boxes and 200 in transplant boxes.

Makiki Station.

At this station the work is principally routine, consisting of mixing and sterilizing soil, transplanting trees into pots and boxes, and doing other necessary work. We are now preparing for the planting season, which generally commences about October and November. We will have large quantities of trees ready by that time.

Honolulu Watershed Planting.

During the month the work consisted of rooting out the Caesalpinia bonduc and clearing away grass and weeds from the young trees. The Caesalpinia bonduc has been all rooted out of Hering Valley and Makiki Main Valley. The area affected will, however, have to be gone over a number of times to prevent it getting a start again. The seed remaining on the ground will sprout and shoots may come up from the small rootlets that could not be found when digging out the larger roots.

Advice and Assistance.

The writer has made the following number of calls and given advice and assistance as follows at the request of people in and around the city:

Calls made	10
Advice by telephone	8
Advice to people calling at Nursery	13
By letter	6
Total	37

Very truly yours,

DAVID HAUGHS,
Forest Nurseryman.

Division of Entomology

ANNUAL REPORT.

Honolulu, Hawaii, December 31, 1915.

Honorable Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

GENTLEMEN:—I have the honor to submit herewith a brief report covering the various lines of work performed by my department during the calendar year, 1915.

The most important work of my division during the year consisted of the usual and important quarantine inspection of fruit, plants, seeds and vegetables from foreign countries, the mainland of the United States and also inter-island shipments of fruit and such other horticultural products as the traffic demanded.

Next in importance was the breeding, distribution and care of all the parasites which were introduced by Dr. Silvestri and Mr. Fullaway during 1913-1915, the main object of this work being to continue liberations of the various parasites and to keep all alive until such time as we can be satisfied that they have established themselves in the Territory.

Besides the above work there has been a lot of general laboratory work connected with the quarantine inspection, parasite breeding, care of insect collections and investigation of pests submitted for advice and remedies.

Staff. Your Superintendent has continued as head of the Division during this year and had the following assistance in the quarantine inspection: Mr. D. B. Kuhns, as assistant inspector, whose time was mostly spent on the harbor front in looking after all vessels arriving at Honolulu. Under him there are three assistants, Messrs. Edward Drew, R. W. Kanakanui and Isaac Kahele. With this force of men I am able to handle all inspections of outside shipments as well as the inter-island inspection. In connection with the inspection work Brother Matthias Newell has continued as fruit and plant inspector at the Port of Hilo, Hawaii.

The following gentlemen, who are acting as honorary inspectors at various ports on the other islands, have not reported any active service during the year. In fact, there is such small chance of any produce going to other ports on the other islands, without first passing through Honolulu, that all these shipments are looked after here before the vessel proceeds on its journey.

Honorary Inspectors. Mr. E. E. Madden, Mahukona, Hawaii; Mr. E. R. Biven, Kahului, Maui; Dr. W. D. Deas, Hana, Maui; Capt. C. F. Turne, Kaanapali, Maui; Mr. W. D. McBryde, Koloa, Kauai; Mr. G. C. Munro, Keomoku, Lanai.

Work Performed. During the year we inspected 674 vessels

arriving at the Ports of Honolulu and Hilo. Of these 335 carried vegetable matter consisting of 16,358 lots and 345,633 packages. Of this amount 339,099 packages were fruit and vegetables, mostly from the mainland of the United States and imported for food; 2,009 packages were seeds of plants, flowers, vegetables and cereals; and 4,525 packages were plants. Of these shipments, 639 packages were destroyed, 1,174 packages were fumigated before delivery and 67 packages were returned to the shipper, all on account of some infestation or other. There has been a material increase in the number of vessels arriving at both Honolulu and Hilo, which is due to the opening of the Panama Canal. There is also a noticeable increase in the number of packages inspected over the number inspected in 1914.

Rice and Bean Shipments. During 1915 400,017 bags of rice and 35,263 bags of various kinds of beans were shipped into the Territory through the Ports of Honolulu and Hilo from Japan and China. All of these shipments receive our closest inspection for cereal pests. During the year only 65 bags of beans had to be fumigated on account of the rice moth *Paralipsa modesta.* This is indeed, very gratifying and indicates that the recent inauguration of plant quarantine stations at various ports in Japan has done much to prevent the shipment of infested rice and beans.

Inter-Island Inspection. During the year 1915 the inspection of horticultural products going from Honolulu to the ports of all other islands has been kept up. Particular attention has been paid to soil shipments attached to the roots of plants as the medium is apt to carry any serious disease at any time. During the year 748 steamers plying between Honolulu and ports on the other islands were attended to and 9,369 packages of plants, fruits and vegetables were inspected and of this number 373 packages were refused shipment either on account of infestation of pests or of having undesirable soil attached to plants.

Federal Inspection. As collaborators of the Federal Horticultural Board we have been much assisted in our work on foreign importations. Especially is this true on the many small packages arriving at the U. S. Post Office. Now that plants and seeds, except flower, vegetable and field seeds, can not be mailed from foreign countries to the United States or Territories we are relieved of a lot of inspection of small packages at the Post Office. By this system we are protected from possible accidental introductions as all packages arriving with plants or prohibited seeds, never reach the owner, but are returned at once to the sender by the postmaster. The compulsion of making application for permit to import plants to the Federal Horticultural Board before any can be shipped into the country helps to keep account of all shipments coming here and we have found it a great help in our work.

Injurious Insects and Plant Diseases. During the year we have been able to keep out a large number of serious pests and diseases

of plants. The following number of insects by genera were found:

Beetles	19 genera
Butterflies and Moths	7 genera
Ants	6 genera
Scale Insects	14 species
Plant lice	6 species
Various	8 species

One lot of small Hermit crabs, said to feed on vegetables in Japan, were taken from a passenger who was taking them as playthings for his boy. Four species of fungi were destroyed on fruits and plants arriving in the baggage of passengers.

Breeding and Distribution of Parasites. Mr. D. T. Fullaway, who has charge of all this work, left the Territory in July for a trip to Java, India and the Philippines in search for parasites for the Melon fly (*Bactrocera* (*Dacus*) *cucurbitae*). Previous to his departure he attended to all the breeding and distribution of the various parasites of the Fruitfly and Horn, Stable and Houseflies which were obtained from the first and second expeditions to Africa. During his absence, since July, this work has been kept up under my direction by my assistants. During the year there were liberated in round numbers 204,664 parasites of the fruit fly, consisting of six species, *Opius humilis, Diachasma fullawayi, Diachasma tryoni, Tetrastichus giffardii, Dirhinus giffardii* and *Galesus silvestrii.* Of these species the first four have been found established in the open and have been reared from fruit gathered from various localities. The two last named species, although thousands have been liberated, as yet have not been recovered either in the open or bred from gathered fruits.

In the control of the Horn, Stable and House fly there were liberated, in round numbers, 51,850 parasites in many districts on all the islands. From material taken in the field we have been able to rear all the species liberated, namely, *Muscidifurax vorax,* an undetermined *African spalangia,* an undetermined *Philippine spalangia* and an undetermined *Philippine Pteromalid.*

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

REPORT FOR JUNE.

Honolulu, Hawaii, July 6, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit my report of the work done by the Division of Entomology for the month of June, 1916, as follows:

During the month there arrived at the port of Honolulu 40 vessels, of which 20 brought vegetable matter. Of these vessels 5 passed through the Panama Canal and called here for coal or provisions.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1184	15,186
Fumigated	10	15
Burned	59	59
Returned	1	1
Total inspected	1254	15,261

Of these shipments 14,972 packages arrived as freight, 118 packages by mail and 171 packages as baggage of passengers and immigrants.

Corn, Rice and Bean Shipments.

During the month 63,923 bags of rice arrived from Japan, 6,141 bags of beans from Japan and Oriental ports and 100 bags of corn from China, this being the last shipment of this staple from any Oriental port. From July 1, 1916, all corn shipments are prohibited into the United States and Territories under Quarantine Notice No. 24 of the Federal Horticultural Board on account of a serious disease (Peronospora maydis) and other downy mildews which attack not only corn but all related species.

All of the above shipments were inspected and found free from cereal pests and allowed to land.

Pests Intercepted.

Approximately 4,282 pieces of baggage were examined from foreign ports, principally at the Immigration Station, and 44 packages of fruit and 12 packages of vegetables were found, seized and destroyed by burning.

A hydrangea plant from the mainland, in baggage, was found infested with red spider and was thoroughly fumigated before delivery. One package of cotton seed in the mail from Manila

was returned by the postmaster as unmailable under rulings of the Federal Horticultural Board. One box of rose plants from the mainland was found infested with an aphis and was thoroughly fumigated before delivery. Seven ornamental plants from Japan were fumigated as a precautionary measure after all soil had been removed. Three cases of plants from California were fumigated as we found a few plants infested with aphids. One case of rose plants from California was found infested with aphids, a red spider, and was fumigated before delivery. A package of gladiolus bulbs by mail was found infested with the bulb aphis and was fumigated with carbon bisulphide before delivery. One case of hydrangea plants from California was found infested with aphids and was fumigated before delivery.

Hilo Inspection.

Brother Matthias Newell reports the arrival of 7 steamers and sailing vessel. Of these 5 steamers brought vegetable matter consisting of 157 lots and 2,618 packages, all of which was found free from pests and was passed. The sailing vessel brought lumber. The steamer "Siyo Maru" arrived direct from Japan bringing 1,370 bags of rice, 265 bags of beans, 17 bags of peas and 10 bags of peanuts. All being free from cereal pests they were passed for delivery. One of the crew brought five 5-needle pine trees ashore and these were seized by Brother Newell, as they are prohibited from landing in the Territory and especially at Hilo, it being no port of entry for foreign plants. Brother Newell had the plants sent here by express and they have been destroyed by burning.

Inter-Island Inspection.

Sixty-one steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	672	bags
Plants	198	packages
Vegetables	72	"
Fruit	37	"
Total passed	979	

The following packages were refused shipment as they did not pass the regulations pertaining to soil and infestations:

Fruit	11	packages
Plants	20	"
Total shipments refused	31	"

Beneficial Insects.

The work of breeding and distributing the various parasites of the fruitfly, melonfly and the various dungflies has been attended to by Mr. D. T. Fullaway, whose report is attached hereto.

Respectfully submitted,

E. M. Ehrhorn,
Superintendent of Entomology.

REPORT OF INSECTARY.

Honolulu, Hawaii, July 5, 1916.

Mr. E. M. Ehrhorn,
Superintendent of Entomology,
Honolulu.

Dear Sir:—Permit me to report on the operations of the insectary during the month of June.

Parasites of the fruit fly were produced in the following numbers:

Tetrastichus	10,900
Diachasma fullawayi	232
Diachasma tryoni	425

and of the melon fly as follows:

Opius fletcherii:	
Males	102
Females	184

Parasites were liberated as follows:

Tetrastichus:		
Nuuanu	2,200	
Manoa	400	
King street	3,200	
Spencer street	1,200	
Lihue, Kauai	1,600	8,600
Diachasma fullawayi:		
Nuuanu	78	
Manoa	17	
King street	88	
Spencer street	27	
Lihue, Kauai	67	277

Diachasma tryoni:		
Nuuanu	119	
Manoa	21	
King street	149	
Spencer street	43	
Lihue, Kauai	83	415
Total		9,292
Opius fletcherii:		
Male	20	
Female	24	44
Total fruit fly parasites liberated		9,292
Total melon fly parasites liberated		44
		9,336

The conditions in the laboratory and in the field are suitable for a very rapid multiplication of the new melon fly parasite, and I expect that we will have the parasite established on all the islands by the end of the present summer.

Very truly yours,

David T. Fullaway,
Field Entomologist.

Division of Animal Industry

ANNUAL REPORT.

Honolulu, Hawaii, April 12, 1916.

The Honorable Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

GENTLEMEN:—I beg to submit a concise report on the work of the Division of Animal Industry for the calendar year ending December 31st, 1915.

Introduction. The principal work of the Division has, as hitherto, consisted in the enforcement of preventive measures against the introduction of diseases of live stock from without, and the suppression of diseases already here. Under the latter head may be added the investigation of various outbreaks of transmissible diseases with a view to finding new, or improving old, methods for their eradication.

The past year has not differed from any of the last preceding ones in regard to attempts at circumventing the board's efforts at excluding and suppressing animal diseases.

That we have, nevertheless, succeeded in keeping rabies out speaks well for the regulations in effect, as this disease has become so widespread in the three Coast states west of the Rocky Mountains, as to warrant the federal Congress appropriating $50,000 for its suppression, and ordering all available forest rangers to organize in a concerted effort to exterminate the rabies-infected bands of wolves, coyotes and dogs which are terrorizing the districts in question.

Neither hog cholera nor glanders has gained entrance here during the past year, with imported stock, while it is possible that a small number of cattle affected with tuberculosis may have arrived here. This, however, cannot be avoided so long as there is not in the whole State of California a single breeder of dairy cattle who can vouch for his herd being free from tuberculosis, even though individual animals may pass the tuberculin test. It is, therefore, to be hoped that one or more of the larger local ranches will specialize in the breeding and raising of one or several of the most sought after dairy breeds (Jerseys, Holsteins, Guernseys), and supply the constantly increasing demand for good milk producers, guaranteed free from tuberculosis. It costs no more to raise a dairy animal than a beef steer, and once a good strain is established the success of the enterprise is assured, and the prospects of an abundant milk supply at reasonable prices will be brighter.

The Live Stock Industry. Never before in the history of the Territory has the live stock industry been in a more flourishing

condition than during the past year. No epidemic of any kind occurred, and feed was abundant in practically all sections. The importations during the past eight or ten years of large numbers of pure bred horses, cattle, sheep and hogs for breeding purposes are now manifesting their value through the excellence of the matured offspring that is reaching the Territorial markets. All animals butchered for meat food products are vastly improved in quality and value, while the scrub steer, the scabby mutton and the razorback hog of ten years ago have practically disappeared. On all ranches and most plantations feed is now being conserved as hay or silage, while steadily increasing areas are being planted to corn, alfalfa and valuable fodder grasses. Under these conditions the hog industry, probably, has developed faster than the other classes of live stock; and while the increased production has had a depressing influence upon the price of butcher hogs, the time is undoubtedly near when pork packing will be established here, and the importation of hams and bacon be discontinued. These pork products—smoked ham and bacon—now cost the consumer around 30 cents per pound, while butcher hogs sell at 9 cents on the hoof and dress out around 80 per cent. The freight on perishable goods from San Francisco to Honolulu is around 3 cents per pound. It does not require a mathematician to figure out that the curing and smoking of the most delectable parts of the hog, that are now sold fresh with difficulty, at the prices they ought to bring, should prove a profitable business. Tons upon tons of smoked ham and bacon are consumed here annually, and until quite recently most of it was imported from the Mainland or from abroad.

The same applies, to a certain extent at least, to the poultry business. Hundreds of thousands of dollars worth of live and butchered poultry and eggs are imported into the Territory annually. That these food products are not produced here is said to be due principally to the presence of a disease of chickens, turkeys and pigeons commonly known as sore-head, chicken diphtheria, or chicken pox. An additional cause is the high price of imported chicken feed—grain and concentrates. These causes of failure may now be said to have been fairly eliminated. There is no longer any need of paying from 2 to 4 cents per pound for chicken feed, nor are the diseases mentioned any longer to be considered as a serious obstacle to the profitable raising of poultry. During the month of September, 1915, the writer attended the annual meeting of the American Veterinary Medical Association at Oakland, California, and there learned of a perfected method of treatment and vaccination against these diseases, which subsequent events have proved effective. While still in its infancy the results obtained in a majority of the outbreaks treated have been so satisfactory as to warrant the conclusion that sore-head or chicken pox can not alone be cured, but can be successfully guarded against by the immunization of the entire infected flock

by a simple and cheap form of vaccination. More than ninety per cent. of badly infected flocks have been saved by this method, even when the disease was so far advanced that the owner had no hope of saving even a single bird.

It is, therefore, to be hoped that poultry raising will again become one of the main props of the small farmer, and will attract capital from among the well-to-do classes, that harbor so many poultry fanciers, but most of whom have become discouraged on account of the high mortality due to these diseases. With the risk of infection eliminated, there is no reason why this Territory should not become a poultry raiser's paradise, just as the past ten years have proved it to be the most successful live stock raising country in the world.

An abundance of eggs should be produced here at 25 to 30 cents per dozen, instead of being scarce at 70 cents, as it recently occurred; and broilers should retail at 3 for 50 cents instead of being 37 to 40 cents per pound.

A circular instructing poultry raisers how to combat the diseases in question is now ready for publication, and will undoubtedly help lowering the prices now paid by the consumer for both eggs and poultry.

Importation of Live Stock.—Hogs. Whether a sufficient number of butcher and store hogs have now been imported to supply the temporary demand created by the large quantities of military mess offal (swill) which became available with the stationing of more than 10,000 soldiers on the island of Oahu, remains to be seen. A total of 2,042 hogs were imported here during 1915, as compared to 1,666 during 1914. Included in this number, however, were 37 pure bred Berkshire hogs (21 boars and 16 sows), 18 Hampshires (4 boars and 14 sows), and 10 Duroc Jerseys (4 boars and 6 sows), and some Tamworths. A considerable proportion of the unregistered hogs were well bred-up Berkshire and Red sows which, with good boars, have produced several thousand pigs on Oahu alone.

Sheep. The number of pure bred sheep imported during 1915, seventy-two head, as compared to 120 during 1914, is but an apparent reduction, as fifty head of New Zealand merino rams missed a steamer and had to be carried over to the 1916 importations. With the exception of ten American merinos, two Hampshires and ten Shropshires, the balance were a select strain, the so-called "bull dog," from New Zealand, which is used almost exclusively by the Parker Ranch on Hawaii in improving both quality and quantity of their wool clip.

The very small importations of rams of the mutton breeds during recent years are in keeping with a general reduction in the size of all the flocks in the Territory. Most of the mutton used in the military messes is frozen carcasses from California or Australia, but as many plantations keep small flocks of sheep for local

consumption, it would undoubtedly pay for these to improve their often badly inbred strains by an occasional importation of a few good Shropshire or other mutton rams. All told there is probably not half the number of sheep in the Territory today that were here 10 or 12 years ago.

Cattle. A total of 111 head of cattle arrived here as compared to 75 head during 1914. Of these one hundred head were dairy cattle—half of this number being Holsteins. That only one dozen registered bulls, of which not less than eight were of various dairy breeds, were imported must be ascribed to the prolonged and widespread epidemic of foot-and-mouth disease, which prevailed in the United States during the greater part of the year. There is, however, no reason to believe that these scanty importations are indicative of a suspension of the development of the local beef herds during the past year. On the contrary, the Territory was able for the first time in recent years to supply its own demand for high class breeding animals. The Parker Ranch, for instance, had prepared for exhibition in San Francisco a splendid herd of selected Herefords of various classes and ages. The same outbreak of foot-and-mouth disease, however, interfered with the sending of these animals to California, and enabled the ranch to dispose of a number of good bulls, which otherwise would have had to be retained. This same ranch having used for a number of years only pure bred bulls, is now sending to the slaughter house hundreds of steers annually, which in quality, color, development and markings are superior to fifty per cent. of the bulls still being used in the Territory for breeding purposes, and it will undoubtedly not be long before the Parker Ranch alone will be able to supply all the pure bred bulls, of the Hereford breed at least, that can be used here.

Horses and Mules. With the exception of horses for military use, an almost negligible number arrived here during the past year, the total falling from 522 in 1914 to 147 in 1915. Mules, on the other hand, increased from 305 to 567, respectively. No jacks and very few stallions were imported for breeding purposes. Nearly all the horses (except military) were of inferior quality, while the mules, for the greatest part, were the best ever seen here. With the assured prospect of free sugar in 1916, the importation of plantation mules had practically ceased, but after the European war made a repeal of the free sugar clause highly probable, the replenishment of the depleted plantation stables began in earnest.

The military authorities, like in the two preceding years, purchased quite a number of island horses for remounts, these hardy and well bred up animals having given complete satisfaction, both as mounts for the cavalry and as saddle and draft animals for the artillery. They are, in fact, preferred by officers and men alike to the western range horses which often lack the

surefootedness required by mountainous country. A considerable number of heavy draft horses and a limited number of large mules were raised and disposed of at good prices, many teams of Percheron grades bringing as high as $500.

It will, therefore, be seen that the general decline in the number of animals imported is due to anything but a lack of prosperity, but is, on the contrary, principally due to the rapid development of local resources along the lines of agriculture and live stock industry.

Diseases of Live Stock. The few outbreaks of transmissible diseases of animals, which have occurred during the past year, have been fully recorded in the published monthly reports of this Division, but a short resume of the situation may, nevertheless, be in place here.

Glanders. No outbreaks occurred during the year.

Enzootic Laryngitis. If this disease has occurred at all it has been in sporadic cases only, and in a very mild form. No epidemic was reported from any part of the Territory, even from sections where it used to be widespread.

Cerebro-spinal Meningitis. One outbreak of this disease, due probably to mouldy bran and barley, caused the death of 13 animals—11 mules and 2 horses—on one plantation on Oahu. On Maui and Hawaii the districts where it generally occurs have suffered about the usual number of cases, if anything less.

Tetanus or Lock-jaw. In only one section, the Hilo district on Hawaii, does this disease seem to be at all common. Here two plantation stables lost a sufficient number of horse stock to warrant the use of preventive doses of tetanus antitoxin in all cases of nail pricks and easily infected wounds. Otherwise very few cases have come to notice.

Osteoporosis. For some obscure reason this disease so fatal to horses and which some years ago was quite prevalent on all of the islands, seems to have become quite rare. Only in so-called Hilo grass districts does it still occur, and here not so often as usual.

Hemorrhagic Septicemia. This fatal disease of cattle and sheep made its first appearance in the Territory, at least in a mildly endemic form during the early part of the past year. Sporadic cases have come to notice from time to time, but what might be termed an outbreak of the disease has never occurred here before. The first two or three cases occurred in a local cattle yard among fat cattle which had been shipped to Honolulu for slaughter. The animals all died within a few days after arrival, and all came from the northern part of the island of Hawaii. This section of the Territory had been blessed with an unusually favorable spring, heavy rains followed by warm weather, as a result of which the mountain pastures had become almost rank with highly nutritious grasses, especially an alfalfa-like legume with yellow blossoms, locally known as pakana grass, which is highly nutritious besides being very palatable, to the animals. The result was

that all cattle in this section fattened very rapidly, became sluggish and many cases of edematous nephritis developed. This condition in itself was of little importance, as it was observed only on the killing floors, and it seems probable that the simultaneous appearance of hemorrhagic septicemia may be directly traced to the resulting lack of vitality and power of resistance. Only the fattest animals became affected, and few, if any, recovered. As a precaution against the disease all overfat cattle were removed to poorer pastures on the leeward slope of the island, where circumstances forced them to travel or go without either water or feed.

With the ripening of the pastures both the nephritis and the hemorrhagic septicemia disappeared, and the question of vaccinating was postponed until future developments may warrant its employment.

Bovine Tuberculosis Control. The annual testing of dairy stock for tuberculosis on the island of Oahu, was finished with a grand total of more than 7,000 tests, 216 of which gave positive results. This means about 3 per cent. of reactors or apparently an increase of one per cent. over last year's results, a condition which would be very discouraging were it not for the fact that not less than 45 reactors were encountered in herds tested this year for the first time, in other words in herds that, strictly speaking, cannot be called dairy cattle but from which milch cows are drawn from time to time. If these herds, comprising 672 head with nearly 7 per cent. of reactors, were deducted from the grand total, the percentage of reactors in general would be reduced to 2.7. When to this is added that 50 reactors were found in two dairies where no testing had been done for sixteen months, and where the disease, consequently, had spread rapidly, it will be found that taken all together there is a decided improvement in the bovine tuberculosis situation in the City and County of Honolulu. With the slaughter or segregation of all the reactors, and with the thorough disinfection of all the premises where reactors have been found, it may safely be claimed that at least 90 per cent. of the local dairies are now, at the end of 1915, free from tubercular infection.

Equally satisfactory conditions can be reported from the other islands where the new sanitary code of the Territorial Board of Health has supplied the long needed authority for a vigorous campaign against this disease. The three deputy territorial veterinarians are now coöperating with the representatives of the said board in their respective districts and no territorial dairy permit is issued until a certificate of tuberculin test has been issued by one of the deputies of this board, and the reacting animals removed. Under these conditions the complete eradication of bovine tuberculosis will require only the coöperation of the owners of the few remaining herds where the infection still persists in order

to be an accomplished fact by the end of 1916. The overproduction of milk in certain localities speaks volumes in support of the contention adhered to by this Division that no hardships have resulted from the bovine anti-tuberculosis campaign, except possibly to milk consumers of the poorer classes.

Hog Cholera. A few scattered outbreaks of this disease have occurred on the island of Oahu, principally in swill-fed piggeries, all of which were easily controlled with the anti-hog-cholera serum. On Maui three small outbreaks occurred which all were checked in their incipiency by the same means. On Hawaii, where the greater part of the Territory's pork supply originates, the disease has been of small importance, with the possible exception of the Puna district, where several small outbreaks have occurred. From Kauai no outbreaks have been reported.

With the general improvement in sanitary and hygienic conditions which the past year has seen inaugurated, the excessive mortality of young pigs seems also to be abating and will no doubt be further reduced as soon as the local hog raisers learn from experience the science of caring for the brood sow and helping the newly born and young pigs to get a start in life.

The hog cholera situation must, therefore, with the end of 1915, be said to be well in hand, especially where all young pigs are serum treated a week or ten days after birth and again at the time of weaning.

A new rule making it mandatory to report without delay any outbreak of swine diseases and the strict quarantining of all infected premises, is under consideration and will, when promulgated, undoubtedly help to suppress what infection may be left within our borders. The distance from the Mainland and the strict requirements pertaining to the importation of hogs from abroad seem to have been adequate to protect us against the introduction of fresh centers of infection from the United States or foreign countries.

Respectfully submitted,

Victor A. Norgaard,
Territorial Veterinarian.

REPORT FOR JUNE.

Honolulu, Hawaii, July 17, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

GENTLEMEN:—I beg to report on the work of the Division of Animal Industry for the month of June, 1916, as follows:

BOVINE TUBERCULOSIS CONTROL.

A glance at the appended report of the Assistant Territorial Veterinarian, covering the tuberculin tests of the past month, will show the average condition of the Honolulu dairy herds in so far as tuberculosis infection is concerned. Seven herds, with an aggregate of 132 head of cows, show but two reactors, one each in two dairies. All of the several dairies are located in the same neighborhood, Sea View and Upper Moiliili, and all have been more or less infected with tuberculosis. One only (M. Nee) is of recent origin, and the one reactor in this herd was a recent arrival from Kona, Hawaii. The six others are old herds. Inouye's, for instance, was included in the first test in May, 1910, when he had but five cows, one of which reacted. Since that time he has built up his herd to 45 head, by raising his most promising heifer calves and, to a certain extent, by purchase. Only once, in 1915, did he get the infection in again, also by a Kona, Hawaii, cow, but this animal either had not reached the infective stage or else his disinfection was effective, as no reactor was found this time. This is indeed a record to be proud of, although it is no more than deserved, for the care that this Oriental dairy man and his wife have taken of the steadily increasing herd is unsurpassed in our experience. Scrupulous cleanliness with animals, premises and utensils and almost excessive care of each individual cow at milking time and otherwise, has brought deserved success.

While the same cannot be said of all the Oriental dairy men, they are, nevertheless, by far the most careful and consequently the most successful milk producers in the Territory, and seem to have comprehended the principles required to guard against tuberculosis infection as well or better than any other class or nationality in this same business.

SORE-HEAD OR CHICKEN-POX.

A large number of outbreaks of this disease has been reported during the past month, and in all cases where the required scabs have been furnished, vaccine was prepared and either injected

into the affected birds, or when on the other islands, forwarded to the applicants for use.

The following observations not hitherto recorded, seem of value:

Age of Birds Affected. A gradual spreading downward in so far as age is concerned, has been noticed as following the advance of warm weather. In the early spring for instance pullets and cockerels, and even mature birds, were most frequently affected. The season's first chickens did not seem to become infected until nearly half grown and fully feathered, that is when they were about 2-pound broilers. During May, 8 to 10 weeks chickens, and during June, 4 to 8 weeks, and even downy 3 weeks old chicks, were commonly affected.

When no treatment was attempted the mortality advanced with the season.

Chicks less than a month old show the lesions first at the margins of the mouth or eyelids, from which they spread rapidly into the mouth as yellow diphtheritic patches or into the eye as cheesy masses of fibrinous exudate. Unless promptly treated both locally and by vaccine, 90 to 100% of these young birds die.

Local Treatment. Our attention has been called to some very good results obtained from the application of ordinary crude or black oil to the sores and scabs, and even to the eye proper, after removal of the cheesy masses, whether more effective than tincture of iodine remains to be seen. It may, however, be considered a good substitute when iodine is not at hand. We believe, however, that iodine is to be preferred for instillation into the eye.

Bad Results from Vaccine. In a few cases, vaccination has resulted in the appearance of bluish black discolorations and swellings at the place of injection, due possibly to spore bearing bacteria resistant to the temperature at which the vaccine is attenuated. In no case, however, has more than a few head in any one flock become so affected. Only one of these was saved by a timely incision into the affected parts and treatment with antiseptic lotions. The fact that such a small number only has become affected in this manner points to the possibility of the needle having been contaminated or else that the skin was soiled at the place of injection. It is, therefore, well to adhere strictly to the instructions which require a sterile needle and the disinfection of the skin before injection. In order to avoid handling two sets of disinfectants, we have discarded the use of cresol solution and use only tincture of iodine, a drop or two of which is placed on the skin at the point of injection, and the needle inserted through the resulting brown spot.

The new vaccine mentioned in the May report is now ready for final test on a large scale, and it would, therefore, be highly desirable if a large flock of young chickens but slightly affected or not yet infected could be located. The vaccine has been made in

four different strengths, but experiments will have to be made on a considerable number of birds to determine the safe application of either, and whether single or double, before a general distribution can be recommended.

HOG CHOLERA.

No outbreak of this disease has been reported during the past month. A visit was made to one of the largest piggeries in the vicinity of Honolulu, but while a few shoats were noticed to be coughing, assurance was given that no hogs had been lost and that serum was applied regularly to all young pigs, a week or ten days after birth, and again at the time of weaning.

CONTROL OF RABIES.

A circular letter addressed to all steamship and transportation companies having offices here, and calling attention to the spread of rabies among dogs, coyotes and wolves in the Pacific Coast States, was sent out during the month. A number of replies calling for additional circulars, posters and copies of the printed regulation (Rule VI, Division of Animal Industry) have been received, and assurances given of said companies' coöperation in the efforts of this Board to keep the disease out of the Territory.

Six dogs arrived during the month, five of which were sent to quarantine, while the one coming from Australia was allowed entry without restriction, Australia being free from rabies.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Hawaii, July 13, 1916.

Dr. V. A. Nörgaard,
Chief of Division of Animal Industry,
Board of Agriculture and Forestry,
Honolulu.

SIRS—I have the honor to submit the following report for the month of June, 1916:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	Tested.	Passed.	Condemned.
G. Keda	11	11	0
M. Nee	19	18	1
Girls' Industrial School	6	6	0
P. Miyakawa	13	13	0
F. Medieros	20	20	0
K. Inouye	45	45	0
College of Hawaii	18	17	1

The above tabulated list gives a total of 132 head tested, out of which number 130 were passed and 2 condemned and branded.

Post-mortem Examinations.

Several post-mortem examinations were made during the month, the results of which are as follows:

No. 1. Cow condemned at Waialae Dairy. Lesions: right prescapular gland much enlarged and contained many nodules.

No. 2. Cow condemned at Waialae Dairy. Lesions: bronchial glands affected; recent infection.

No. 3. Cow condemned at Waialae Dairy. Lesions: no lesions found in parts examined, but a number of the internal organs and glands were missing.

No. 4. Heifer condemned at Waialae Dairy. Lesions: small recent nodules in mediastinal gland.

No. 5. Cow condemned at Waialae Dairy. Lesions: retropharyngeal glands affected; recent infection.

No. 6. Retropharyngeal glands much enlarged and contained old calcareous, encapsulated nodules surrounded by many nodules of recent growth.

No. 7. Cow condemned at Waialae Dairy. Lesions: bronchial glands affected; recent infection.

Stephanurus Dentatus.

A considerable outbreak of this parasitic infection has lately occurred on the Island of Hawaii, and one case was sent from Kona to this office for post-mortem examination, the results of which are as follows:

Subjects: A four months' old shoat in a moribund condition, weighing about fifty pounds.

Lesions: Body well covered with subcutaneous fat, as were intestines and kidneys.

Liver somewhat enlarged, general color normal and containing numerous hemorrhagic infarcts due to plugging of the blood vessels by immature worms.

Stomach, spleen, intestines and mesentery, normal.

Kidneys, normal in size and color and containing no worms. In the sublumbar fat and the fat surrounding the kidneys many

worm cysts were found containing from one to three mature worms, together with more or less greenish purulent debris.

Chicken-pox or Sorehead.

There has been a steadily increasing demand for chicken-pox vaccine, many demands coming from the other islands. During the month 1000 c.c. of vaccine has been prepared and 200 chickens injected, the balance of the vaccine being sent to the other islands.

Importation of Live Stock.

S. S. Wilhelmina, San Francisco.—1 dog, C. S. Babcock; 1 dog, Miss E. Thomas; 52 cts. poultry.

S. S. Hyades, Seattle.—8 Berkshire hogs, Maui Agricultural Co.

S. S. Ventura, Sydney—2 monkeys, 1 kangaroo, 1 dog, Mr. Thomas Fox.

S. S. Sierra, San Francisco.—1 dog, W. Beck.

S. S. Matsonia, San Francisco.—2 dogs, J. A. Magoon; 34 cts. poultry.

S. S. Lurline, San Francisco.—2 Jersey cows, 2 Duroc-Jersey hogs, J. H. Magoon; 1 horse, Mrs. Bowen; 16 cts. poultry. Kahului: 1 horse, H. A. Baldwin; 1 ct. poultry, Maui Agricultural Co.; 1 Berkshire sow, G. F. Krauss.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Division of Hydrography

ANNUAL REPORT.

Honolulu, Hawaii, January 26, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

GENTLEMEN:—The following brief report of operations of the Division of Hydrography during the calendar year 1915 is submitted:

Scope of Work. The hydrometric work in Hawaii during 1915 has been done, as in the past, by the Territory of Hawaii, represented by this division in coöperation with the Water Resources Branch of the United States Geological Survey. The technical personnel has been provided by the survey while the greater part of the funds available for this work have been appropriated by the Territory. Attention is invited to the financial statement.

While the original plan of obtaining detailed reliable hydrometric data relative to all surface water sources in the Territory, regardless of ownership, has been generally adhered to, there has been a much larger portion of time and effort given to the investigation of waters owned by the Territory than in previous years.

This has been brought about, largely, by the fact that several Territorial water licenses, under which private corporations pay certain fixed annual rentals for the use of government waters, will terminate in the near future. The value, and necessity, of accurate information relative to the amounts of water supplied under each license is recognized by both the water users and the Territorial officials, and this division is making intensive investigations of these sources of water in order that the necessary data may be available at the proper time.

The value of accurate data relative to the flow of privately owned streams and ditches has also become more generally recognized during the past year. Many private corporations have expressed a desire to utilize the services of the expert personnel of this division and a willingness to pay all costs—including the salaries of the experts—incident to intensive investigations of not only their sources of supply, but also of their water distributing systems.

Attention has also been given to the collection of data which may be of especial value to the city of Honolulu in connection with its water supply.

WORK ACCOMPLISHED.

General Investigation of Water Resources. It is estimated that ninety-five per cent. of all streams and springs, both of government and private ownership having a minimum discharge of one million gallons per day or more, on the islands of Kauai, Oahu, and Maui have been under observation during the year. There has been more demand for these data, both by government officials and private water users, than ever before. The following brief table shows the number of stations maintained during the year:

STREAM MEASUREMENT STATIONS.

Island	No. of Regular Gaging Stations					No. of private stations for which records are available.	Measurements	
	Maintained on Jan. 1, 1915.	Established during year...	Discontinued during year..	Maintained on Dec. 31, 1915.....	Total maintained during year.....		Made at regular stations during year.....	Made at miscellaneous points during year.....
Kauai	25	4	3	26	29	0	157	11
Oahu	32	4	1	35	36	0	142	25
Maui	35	1	0	36	36	0	62	3
Hawaii	0	0	0	0	0	2	0	21
Total	92	9	4	97	101	2	361	60

Ditch Flow Investigations. A great amount of data relative to the amounts of water diverted from Territorial lands by private water users was collected during the year. All available ditch flow records kept by private water users were collected and from these, as well as from the ditch and stream flow records obtained directly in the field by this division, a very fair approximation of the value of the waters diverted from Territorial lands under the various water licenses and land leases on the islands of Kauai, Oahu, and Maui, has been made. These data, which were embodied in a report to the Commissioner of Public Lands, follows:

"The following table of water quantities and values has been prepared from data available in this office. Records covering periods of from three to six years are available for all important ditches diverting government waters.

"You will note that these data are segregated under two heads —*'Developed'* and *'Potential.'* Under *Developed* are included the waters diverted by existing ditches and other structures. Under

Potential are included waters which may be feasibly utilized in the future, in addition to those now being diverted.

"The quantities and valuations are based on the mean flow during the six ten-day periods of lowest discharge. The valuations on the developed water are based on a flat rate of $5.00 per million gallons, a rate considered very reasonable under the present prosperous industrial conditions. The valuation of the water under *Potential* is estimated at $3.00 per million gallons. All values are based on 300-day years to allow for ditch maintenance.

COMMERCIAL VALUE OF TERRITORIAL WATERS.

Waters	Developed		Potential	
	Million gallons per day.	Annual value at $3.00 per million gallons...	Million gallons per day..	Annual value at $5.00 per million gallons...
Anahola	12	$ 21,600.00	..	$
Kapaa	10	18,000.00	..	
North Wailua	21	37,800.00	10	10,800.00
South Wailua	..		8	8,640.00
Waimea (Kekaha)	43	77,400.00	..	
Waimea (Kekaha, Power Pumping Plants)	..	15,000.00	..	
Hanalei	..		30	32,400.00
Waioli	..		10	10,800.00
Totals for Kauai	86	$169,800.00	58	$62,640.00
Oahu—				
Waiahole	9	$ 16,200.00	..	
North Fork Kaukonahua	15	27,000.00	..	
Waimanalo	1	1,800.00	..	
Totals for Oahu	25	$ 45,000.00	..	
Maui—				
(East Maui):				
Hamakua and Koolau	100	$180,000.00	..	
Hana and Kipahulu	..		10	$10,800.00
(West Maui):				
Honokawai	6	10,800.00	..	
Lahainaluna	1	1,800.00	..	
Olowalu	4	7,200.00	..	
Ukumehame	3	5,400.00	..	
Kahakuloa	..		1	1,080.00
Totals for Maui	114	$205,200.00	11	$11,880.00
Grand totals for Kauai, Oahu and Maui	225	$420,000.00*	69	$74,520.00

* Includes $15,000.00 for Kekaha Power Plants.

"An investigation is now being made of the value of government waters on Hawaii. This will be covered in a later report."

At the request of the Governor of Hawaii special investigations of the amounts of water diverted from various Territorial lands under leases and licenses which will terminate within the next three years have been made, and separate reports thereon have been made, and separate reports thereon have been made to His Excellency. These investigations included the following waters diverted:

Kauai. The waters diverted from the Waimea River drainage area by the Kekaha and Waimea plantation power and irrigation ditches, and from the North Wailua, Kapaa, and Anahola drainage areas by ditches serving the Lihue Plantation Company and the Makee Sugar Company.

Maui. The waters diverted from the Territorial lands of Koolau on East Maui by the four large ditch systems of the East Maui Irrigation Co.

Copies of all these reports have been submitted to you with the regular monthly reports from this division.

In addition to the reports furnished the Governor of Hawaii, an investigation has been made of the water diverted from the private lands in the Kailua valley, Oahu, to serve the Territorial lands under lease by the Waimanalo Sugar Company.

The following table shows the number of ditch measurement stations from which records were obtained during the year:

DITCH MEASUREMENT STATIONS.

Island	No. of Regular Gaging Stations					No. of private stations for which records are available.	No. Measurements	
	Maintained on Jan. 1, 1915.	Established during year...	Discontinued during year..	Maintained during year on Dec. 31, 1915.....	Total maintained during year		Made at regular stations during year.....	Made at miscellaneous points during year.....
Kauai	12	5	6	11	17	2	55	4
Oahu	15	2	1	16	17	0	37	66
Maui	7	0	0	7	7	7	10	12
Hawaii	0	0	0	0	0	0	0	7
Total	34	7	7	34	41	9	102	89

Ditch Seepage Investigations. Ditch loss investigations were made on Kauai and Oahu. The Kekaha ditch on Kauai showed a loss of about 17 per cent. in the first eight miles of its length.

On Oahu, investigations were made on the Oahu, Waialua, and Kahuku plantations. All of the data obtained are on file in this office, and are available for the public.

United States Army Water Supply Investigations. At the request of the Commanding General, Hawaii Department, U. S. Army, a complete investigation of the existing and proposed water supply systems for Schofield Barracks was made, and a report with recommendations made thereon.

Two continuous record stream measurement stations have been maintained during the year by the military authorities on the South Fork of the Kaukonahua Stream—the principal source of supply for Schofield Barracks. These stations have been operated, and the records therefrom worked up into daily discharge tables, by this division.

A reconnaissance was made of the area between Diamond Head and Makapuu lighthouse to determine the water in the various valleys, available for military purposes, and a report was furnished to the Chief Engineer Officer, Hawaiian Department, U. S. Army.

City of Honolulu Water Supply Investigations. A large amount of surface stream and ditch flow data obtained by this division in its general investigation work has been furnished the Honolulu Water Commission. In addition to these the following special investigations have been made:

A careful study of the flow from the upper Punaluu valley on windward Oahu, and of the U. S. Army topographic maps led to the conclusion that the City of Honolulu could add about ten million gallons per day of pure mountain water to its supply by utilizing the Waiahole Tunnel to transmit this flow through to this side of the Koolau range, in addition to the flow anticipated by the Waiahole Water Co.

Tentative and liberal cost estimates indicate that this water may be delivered to an elevation of about 600 feet above sea level, in the upper Nuuanu valley, at a cost of between $0.03 and $0.04 per thousand gallons. The salient features of the project are:

1. A hydro-electric pumping plant in the Punaluu valley to lift part of the Punaluu flow to a level sufficiently high to deliver it by gravity to:

2. A system of tunnels to deliver the waters into the end of the existing Waiahole system in Kahana valley.

3. The transmission, via the Waiahole system, of the water to the Waiawa portal of the main tunnel, at a satisfactory rate of payment to the Waiahole Water Company for this service.

4. A twelve-mile pipe and tunnel line from the Waiawa portal to upper Nuuanu valley.

5. A liberal rate of payment per million gallons to the present lessor of the Punaluu valley. This lease still has about forty

years to run. By the time this lease terminates, (under the agreement made between the Waiahole Water Company and the Territory of Hawaii)—six million gallons per day of the Waiahole water owned by the Territory, will revert to the Territory and will be available for delivery to Honolulu, via the Waiahole Tunnel and the twelve-mile pipe and tunnel system already constructed from Waiawa to Honolulu. Ten years later all Waiahole water (between 8 and 10 million gallons per day), will return to the Territory and be available for Honolulu's water supply by the same system.

In December a series of measurements were made of the seepage from No. 4 reservoir. These measurements proved conclusively that the leakage from this reservoir is due to leakage from the outlet pipe, at some point within the dam structure. Indications point to faulty construction when the pipe was put in place. The results obtained lead to the conclusion that the dam structure is practically leak-proof and is absolutely safe.

Kona, Hawaii, Investigation and Report. The Legislature of Hawaii during its 1913 session, appropriated $5,000.00 for a special investigation and report of the surface water resources of North and South Kona, Hawaii, to be made by this division.

This report was completed in February, and printed copies thereof were distributed to all interested parties. The investigation and report were completed at a cost of $3,072.51.

The Waiahole Tunnel Water Measurements. Measurements of the flow of water developed in the main Waiahole Tunnel were made at both portals, at regular intervals, during the year. These measurements show that the outflow from the north, or Waiahole, portal, decreased from about 32 million gallons per day in January to about 8 million gallons per day in December. The outflow from the south, or Waiawa, portal, decreased from about 15 million gallons per day in July to less than four million gallons per day in December.

Legal Services. The services of technical employees of this division were used to a considerable extent by the Attorney General's Department during the year—especially in the Hilo Boarding School Ditch Case tried at Hilo, and the Waikoloa Water Case, at Waimea, Hawaii.

Territorial Water Commission. The Legislature of Hawaii in its 1915 session enacted a law (Act 36)—drafted by the Superintendent of Hydrography—providing for the creation of a commission of three members to investigate both the physical and legal aspects of the waters in the Territory, both surface and underground, and to report thereon, with recommendations, to the next legislature. The members of this committee were appointed in December, and consist of Messrs. G. K. Larrison, chairman; Arthur G. Smith, and T. F. Sedgwick.

Flood Storage Investigation. Streams on the windward side of

Oahu, between Punaluu and Waimea, have practically no low water flow; but a large flood discharge. The discovery of two possible large reservoir sites near Laie and Kahuku have led to the investigation of the flood flow of streams in this vicinity. Continuous record stream measurement stations were established at high elevations on five of the largest streams in the vicinity, and almost continuous records of all flow of these streams have been secured since. The cost of these stations was paid by the Laie and Kahuku plantations. This division is maintaining and operating the stations and furnishing the data therefrom to those interested.

Weather Conditions. This division maintains about eighty-nine rainfall stations at high elevations, and at various places where the U. S. Weather Bureau is unable to receive daily observations. These stations are equipped with instruments which may be read at monthly or longer intervals, and are visited by employees at irregular intervals in connection with other duties.

The following brief summary of 1915 weather conditions is based on both the records of this office and the published records of the U. S. Weather Bureau:

The first three months of the year were dry and in March a serious condition of drought existed over most of the Territory. About the middle of April the drought was broken by heavy down-pours which caused much damage to crops and structures. At Hana, Maui, on April 27th, over 24 inches of rain fell in less than four hours—according to the U. S. Weather Bureau observer at that place. The month of May was fairly dry, but June and July brought abundant rainfall without storms over most of the Territory. August was fairly dry. About September 15th heavy rains began over most of the islands, and continued during most of the rest of the year, terminating in a heavy "Kona" storm which broke over the islands on December 24th and lasted several days.

The year ended with all streams and reservoirs filled to their limits and with no indications of water shortage in the near future.

The following table shows the rainfall measurement stations maintained by this division on the various island:

RAINFALL MEASUREMENT STATIONS.

Island	Maintained on Jan. 1, 1915	Established during year	Discontinued during year	Maintained on Dec. 31, 1915
Kauai	40	2	2	40
Oahu	9	2	2	9
Maui	22	0	10	12
Molokai	0	4	0	4
Hawaii	27	4	8	23
Kona Investigation	6	0	5	1
Total	104	12	27	89

Reports. According to the coöperative agreement made between the Territory and the United States Geological Survey, the Survey undertakes the publishing in printed reports all data and information secured in the Territory. These reports have in the past covered calendar years and the data contained therein have been published in the "cubic foot per second" rate of flow unit, which is the mainland practice. An over abundance of work at the Government Printing office at Washington, D. C., has resulted, in the past, in the appearance of these reports from one to two years after the end of the calendar year.

In order that Hawaiian water users may have these annual reports published in units of rates of flow with which they are familiar, authority was secured under which all future Hawaiian reports will use the rate flow unit of "million gallons per day," instead of the "cubic foot per second" or "second-foot."

As all Territorial funds available for this work are appropriated for periods ending June 30th, all future annual reports will cover the local fiscal instead of the calendar year.

A biennial report covering the period ending June 30, 1915, is now practically complete and will be forwarded to the Washington Printing office in the near future. In order that water users and others interested in these data, may not be inconvenienced by the unavoidable delay in getting out the printed report, arrangements have been made whereby blue print copies of data relative to any locality will be mailed free of charge to those requesting the same.

Respectfully submitted,

G. K. Larrison,
Superintendent of Hydrography.

REPORT FOR JUNE.

Honolulu, Hawaii, July 13, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

GENTLEMEN:—The following report of operations of the Division of Hydrography during June, 1916, is submitted:

Weather Conditions.

The rainfall was generally abundant during the month over all of the islands. A short period of dry weather in Kohala, Hawaii, was broken by generous rains during the latter part of the month. No heavy storms or floods were reported.

Territorial Water Commission Work.

The services of Assistant Engineers R. C. Rice and R. D. Klise were used during the month on the collection, tabulation, segregation, etc., of surface and underground water data for the Territorial Water Commission, and the salaries and expenses of these men were paid from the funds appropriated for this purpose. A large part of the time of the Superintendent of Hydrography, who is chairman of this Commission without additional pay, was also devoted to this work.

Special Work For the Governor.

At the request of the Governor of Hawaii a letter was prepared outlining some of the obstacles to be encountered in the distribution of government water to homesteaders. A copy of this letter, which is still to be considered confidential, is attached hereto.

Plans For the Future Licensing, Distributing, and Fixing the Price of Government Waters.

A large amount of data have been collected and tentative plans have been made for the future licensing, distributing and fixing the price of Territorial waters. The U. S. Reclamation Service has furnished copies of regulations and rules pertaining to the distribution, notation, etc., of water to water users as well as plans for structures used in this work. The Territory of Hawaii is very much indebted to the Director and Chief Engineer of the Reclamation Service for these plans and regulations, and for much good advice relative to water distribution which was furnished in the form of several letters. It is the intention of the writer to make a special report on this subject in the near future.

Makua and Lualualei Investigations.

Accompanying the Superintendent of Forestry, the writer investigated the water resources of the upper Makua and Lualualei valleys on Oahu during the early part of the month. A copy of the report relative thereto is attached hereto.

Flood Storage Investigation.

At the request of the Governor of Hawaii an investigation of flood water storage possibilities in the upper North Wailua, Kapaa, and Anahola valleys of Kauai was begun on June 30th.

Operation and Maintenance Work.

Only routine stream, ditch, and rainfall measurement and station and trail maintenance work was carried on during the month on the various islands.

On Kauai, W. V. Hardy visited 29 stream and ditch and 6 rainfall measurement stations, and made 24 measurements. Two new measurement stations were established on the Makaweli River and the Kamenehune ditch. D. E. Horner was seriously ill during the greater part of the month.

On Oahu 34 stream and ditch and 4 rainfall measurement stations were visited and 29 measurements were made. Twenty-three stream and ditch measurement stations in the Kailua, Kaneohe, and Heeia valleys which have been maintained in coöperation with private corporations in the past were discontinued. The coöperating corporations considered the past records as sufficient for their purposes.

On Maui 28 stream and ditch and one rainfall measurement stations were visited, and 18 measurements were made.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

BY AUTHORITY.

FOREST RESERVE HEARING DISTRICT OF HONOLULU, ISLAND OF OAHU.

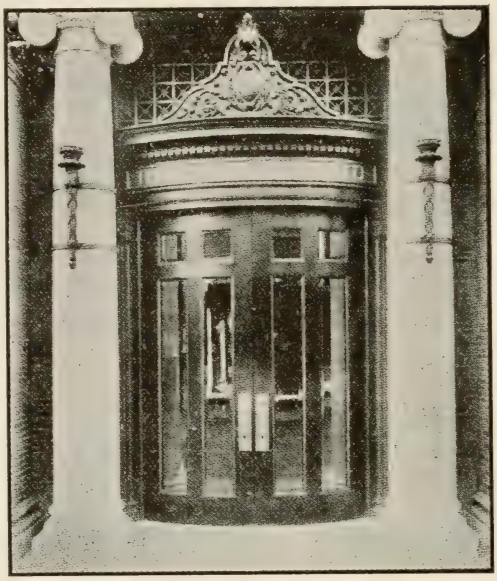
Notice is hereby given that under the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, a public hearing will be held by the Governor of the Territory and the Board of Commissioners of Agriculture and Forestry on Thursday, the 10th day of August, 1916, at 10 o'clock a. m., in the office of the Board at the Government Nursery, King street, in the City and County of Honolulu, to consider the setting apart as a forest reserve, to be known as the ROUND TOP FOREST RESERVE, of a portion of the government land of Makiki, District of Honolulu, Island of Oahu, having a net area of 115 acres, more or less.

A map and description of the said land to be set apart as a forest reserve are on file in the office of the Superintendent of Forestry where they are open to the inspection of the public.

At the said time and place all persons who so desire will be given full opportunity to be heard upon the subject matter of this notice and to present evidence and arguments in person, by proxy, or by letter, either FOR or AGAINST the setting apart of said land as a forest reserve.

LUCIUS E. PINKHAM,
Governor of Hawaii.

The Capitol, Honolulu, July 26, 1916.



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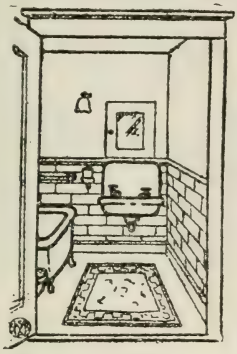
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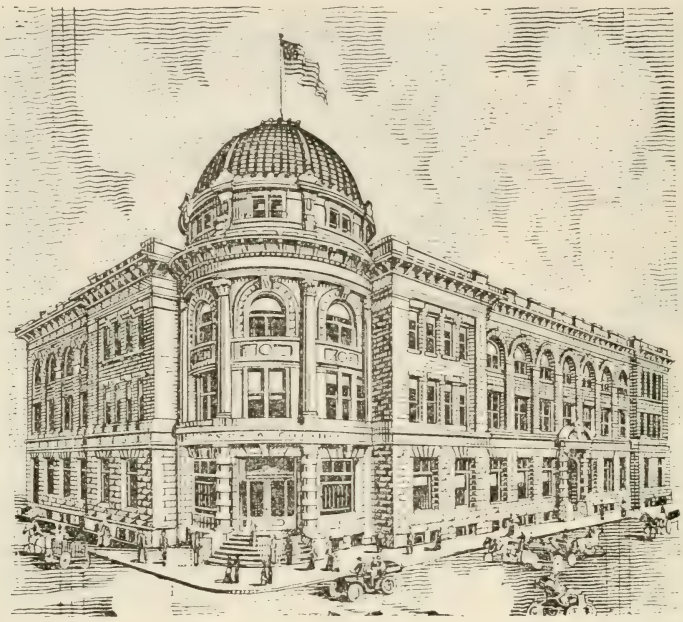
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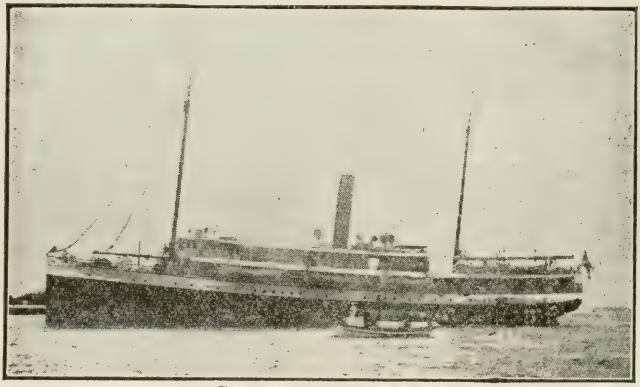
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THE HAWAIIAN FORESTER AND AGRICULTURIST

AUGUST, 1916

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

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The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, AUGUST, 1916. NO. 8

The reports of the superintendents of the four divisions of the Board, for the fiscal year ended June 30, 1916, which appear in this issue, tell of the continued good work being done to aid forestry and agriculture and allied industries in the Territory. Special attention is called to the continuation of the work of forest protection by fencing forest boundaries and the appointment of additional forest rangers; the continued rigid inspection of imports of vegetable matter to prevent further injurious insects from reaching these shores, the breeding of beneficial parasites on pests established here and the introduction of a new parasite on the melon fly; the continued campaign to eradicate bovine tuberculosis and the practical application of a cure for sorehead on chickens; and the progress made in obtaining measurements of government water which will increase the amount of revenue coming to the Territory from water in the future.

The report of Field Entomologist D. T. Fullaway on his successful expedition to India for a parasite on the melon fly, printed herewith, will be of interest to those who are eager to see the expansion of secondary agriculture in the islands. Mr. Fullaway has been successful in the multiplication of the parasite and during July liberated a total of 2,159 on Oahu, Hawaii, Molokai, Maui and Hawaii.

The arrival in July of parasites on the corn leaf hopper, brought by Mr. Herbert Osborn of the Sugar Planters' Association, and their successful propagation and distribution, will also be a great benefit to the corn planter and small farmer in the Territory.

The further experiment of growing timber trees from other tropical countries on the higher slopes of Mauna Kea should throw some light on the question of whether it will be possible to produce locally timber suited to the needs of these islands.

The use of the new sorehead vaccine has resulted in preventing the loss of a great many birds to poultry raisers throughout the Territory.

The case of forage poisoning of hogs on Maui, reported by the Assistant Territorial Veterinarian, shows that it is poor economy and dangerous to feed to hogs grain which has caused the death of horses and mules.

Two New Rules Adopted

The Board of Commissioners of Agriculture and Forestry has recently adopted and the Governor has approved the two new rules printed in this issue.

Rule IX of the Division of Animal Industry, approved by the Governor on August 8, 1916, concerns hog cholera and other diseases of swine and was found necessary in order to handle more adequately the suppression of hog cholera epidemics in the Territory. Before adoption the rule was sent to all hog raisers in the islands and was received with favor.

Rule XVIII of the Division of Entomology, approved by the Governor on September 2, 1916, provides for a further amendment of the original rule to allow pineapple fruit only to be shipped from Honolulu to the Island of Hawaii. The original rule prevented pineapples, pineapple plants, and suckers from being shipped from Kauai to other islands and was amended to prevent the same from being shipped also from Oahu, in order to prevent the spread of a fungus disease discovered on pineapples on those two islands. Of late, however, this fungus has not been active and on the advice of experts the Board decided that clean pineapple fruit could safely be shipped from Honolulu to Hawaii, where it is scarce and is in great demand especially by tourists visiting the volcano of Kilauea.

The Round Top Forest Reserve

On August 10, 1916, the public hearing on the proposed Round Top Forest Reserve, Oahu, was held and there being no objections raised, the area was set apart as a forest reserve by proclamation of the Governor on the same day.

This new reserve, which has a net area of 115 acres, includes the government land on Round Top above the new Round Top road and extends to the northeast as far as the privately owned land near Sugar Loaf. It is bounded by the Honolulu Watershed Forest Reserve on the Makiki side to the southwest, by vacant public land on the Manoa side to the northeast, and by the Makiki lots on the makai side toward Honolulu. The new Round Top road winds through the mauka part of the reserve and makes it very accessible to those who visit it in vehicles. The U. S. Military Reservation of 3.9 acres near the top of Round

Top is excluded from the reserve by the proclamation which appears in the By Authority pages of this issue.

It is planned to make this a natural park-like area, improving the appearance of the land by judicious tree planting but not to obscure in any way the wonderful views which are disclosed from many parts of the reserve. Paths will be built to the various view points to make them accessible to pedestrians and it is planned to build a shelter for picnickers from private funds which have been promised.

Reorganization of the Division of Entomology

On June 30, 1916, the Board decided upon a reorganization of the Division of Entomology and voted to put it into effect as far as possible. To make this reorganization complete, the necessary change in titles must be sanctioned by the next session of the legislature by making appropriate changes in the law. In the meantime the reorganization is in operation so far as practical work goes.

The old division is separated into two divisions—the Division of Plant Inspection with Mr. E. M. Ehrhorn in charge as "Chief Plant Inspector" and the Division of Entomology and Parasitology with Mr. D. T. Fullaway in charge as "Entomologist."

The work of these two divisions is quite distinct—the first handling the inspection of all imports of vegetable matter liable to carry insects and the enforcement of the plant quarantine and inspection regulations; the second handling the investigation work of entomology, the introduction, breeding and distribution of parasites, and remedies for local insect pests. At the same time each division is to coöperate with and assist the other division in the best interests of the Territory.

REPORT OF THE

Division of Forestry

OF THE BOARD OF AGRICULTURE AND FORESTRY FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

The primary object of adopting modern methods of practical forestry in these islands is to foster and increase the source of water supply. This is done in two ways, by forest protection and forest extension and, as in the past, the main efforts of the Division of Forestry during the year have been along these lines. The work of forest protection has consisted of constructing new fences and repairing existing fences on forest reserve boundaries to keep wandering stock from damaging our susceptible native forests; of improving the administration and protection of the forest reserves by establishing rules and regulations and by maintaining and increasing the forest ranger force to see that these are carried out; by the continuing of the forest fire service to detect and extinguish grass and forest fires; and by placing more forest land in the general forest reserve system.

Greater protection of the forests on government lands within the reserves has been secured by the construction during the year of 5.76 miles of new fences and the repair of 10.41 miles of existing fences on forest reserve boundaries. Stretches of new fences were constructed where they were most needed at Anahola and Moloaa, on Kauai, at 29 Miles and 24 Miles along the Volcano Road, Olaa, on Hawaii, and at Lualualei on Oahu. Existing fences on forest reserve boundaries at Lualualei and Pupukea on Oahu, and at Wailua and Kapaa on Kauai, were repaired and strengthened. In other words, during the year a total of 16.17 miles of forest reserve boundaries were effectively made stock-proof.

Rule II of this Division received the approval of the Governor in April and at once went into effect. This rule, which aims at the better administration and protection of government lands within the forest reserves forbids, among other things, the destruction of property and pollution of streams and the unauthorized taking of material, grazing of stock, hunting, or use of land within the reserves, and forms a working basis for forest administration which, up to this time, this Division had lacked. It is based on the regulations of the U. S. Forest Service which have been tried out for many years on the 150 million acres of National Forest lands all over the United States and have proved satisfactory. During the year two additional forest rangers have been appointed for the better administration and protection of the forest reserves and they have done effective work. There are now three rangers on Oahu and one on Kauai. Another has

just been appointed for Hawaii and with the early appointment of a forest ranger for Maui, the forest reserve field force will be up to full strength.

Forest protection has been further effected by the prompt extinguishment of the seven grass fires which occurred during the year. Only one of these, at Schofield Barracks, Oahu, reached the native forest and did some damage before it was put out.

Considerable work, of a preliminary nature, toward the inclusion of additional forest land in the general reserve system was accomplished during the year but only one new reserve of 15 acres in Manoa Valley, Oahu, was actually created by proclamation of the Governor. The Territory now has 38 forest reserves on the six main islands which aggregate in area 798,229 acres. Of these, 546,237 acres consist of government land.

Forest extension during the year has consisted of the actual work of tree planting by the Division and the encouragement of planting on private waste lands by the raising and distribution at cost of tree seedlings. The planting of native trees on the Honolulu watershed in the Makiki Valleys and near Sugar Loaf was continued by the setting out of approximately 3,000 koa and kukui trees. In less than three years, a total of 15,885 trees have been planted in this region and cared for and to date 82 acres have thus been successfully reforested with the same species of native trees which originally occupied the land. Approximately 12,000 trees of various species have also been planted by this Division on the Papapaholahola Spring and Kealia Reserves on Kauai.

Tree planting by private parties and this Division combined during the last calendar year resulted in the setting out of a total of 874,489 trees. It is noteworthy that the object of 53% of this planting was fuel production and 52% of the trees planted consisted of Swamp Mahogany, a quick growing and ratooning species of eucalyptus. A study of the wood fuel situation in the Territory has been begun with the object in view of reducing the price of this commodity.

The total number of trees raised by this Division and distributed to tree planters during the last calendar year amounted to 247,432. The fact that over three times this number were planted during the same period shows that interest in tree planting is now so permanent that many private nurseries for this purpose have been established. Arbor Day was, as usual, celebrated in November and 21,248 trees were sent out from the government nurseries for planting on this worthy day. This number has been exceeded only on two previous Arbor Days and on this last occasion 1,350 school children called at the government nursery in Honolulu and each took one tree away for planting.

In conclusion, it may be said that much progress has been made

during the year in forest protection and extension, the two requisites for the maintenance of a sustained and sufficient water supply.

C. S. JUDD,
Superintendent of Forestry.

Honolulu, Hawaii, July 5, 1916.

REPORT OF THE

Division of Entomology

OF THE BOARD OF AGRICULTURE AND FORESTRY FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

The work performed by the Superintendent and his assistants, of the Division of Entomology, during the fiscal year of July 1, 1915, to June 30, 1916, consisted of the following:

1. The inspection of all fruits, vegetables and plants coming into the Territory from foreign countries and the mainland as a preventive against introducing new pests and plant diseases so injurious to the various agricultural industries in other countries.
2. The inspection of all fruits, vegetables and plants that are shipped from the port of Honolulu to the ports of all the other islands. The purpose of this inspection is to prevent any pest accidentally introduced on Oahu, of which Honolulu is the port of entry, from being carried to the other islands.
3. The collecting, breeding and distribution of parasites of the various pests now known to trouble agricultural industries. Especially has this been done during the last period for the fruit-fly and melon-fly, so detrimental to the production of good fruit, melons, squash, cucumbers and other vegetables. Also the breeding and distribution of parasites of the various dung-flies, horn, house and stable-fly.
4. The dissemination of such advice and general information as was possible for the control of insect pests and plant diseases so troublesome to the grower.

Inspection.

Foreign and Mainland.

The inspection of horticultural products, such as fruits, vegetables, plants and seeds, has been the principal work of the Superintendent of Entomology. Owing to the opening of the Panama Canal, the increase of shipping to the port of Honolulu has been quite noticeable and although many vessels arriving here after passing through the canal have no cargo for the islands,

yet they require our attention upon arrival and during their stay in port.

During the fiscal period there arrived at the ports of Honolulu and Hilo 634 vessels. Of this number 323 vessels carried matter subject to inspection by this Division which consisted of 300,613 packages of fruit and vegetables and 6,008 packages of plants and seeds. Of these shipments 1,584 packages were fumigated for injurious insects found upon them or as a precautionary measure for finding traces of injurious insects. Six hundred forty-eight packages were destroyed by burning on account of being infested with insect pests which fumigation would not reach nor kill, or being entirely prohibited from entry into the Territory, and 41 packages were returned to the shipper on account of coming by mail from a foreign country which is prohibited under the rules of the Federal Horticultural Board. Fruit and vegetable shipments were returned to shipper on account of being too badly infested with pests or fungi to allow their dissemination in the markets and the country.

The prohibition of plant and seed shipments through the mails from foreign countries tends to diminish the chances of accidental introduction of serious pests.

All fruits and vegetables arriving from the Pacific Coast are used for local consumption and owing to the rigid inspection and standardization of these conditions there, these shipments present a very clean and improved condition when compared with those of a few years ago. A few of the more important fruit and vegetable shipments consisted of:

Cabbages	2,735 crates
Lemons	6,951 boxes
Onions	30,999 crates
Celery	2,450 crates
Oranges	51,621 boxes
Potatoes	111,434 bags

Some of these commodities have of late been grown in larger quantities in the islands and there seems no reason why this should not be encouraged.

Inter-Island Inspection.

The inspection of all fruits, vegetables and plants leaving Honolulu for ports on the other islands has continued on the same lines as last year. During the fiscal year 732 steamers were attended to and 9,087 packages of plants, fruits and vegetables have been inspected. Of this number 321 packages were refused shipment either on account of being infested with pests or of having

undesirable soil attached to the roots, which was liable to carry some fungus disease.

Parasitic Work.

During the greater part of the fiscal period the work of breeding and distributing the various parasites for the fruitfly, horn, house and stable flies has been under the direct supervision of the Entomologist on account of the absence of Mr. D. T. Fullaway, who went to India, Java and the Philippine Islands in search of a parasite for the melon-fly. Our chief aim has been to keep alive all the various parasites which were brought here by the first and second expeditions to Africa. There have been bred and liberated in various districts on all of the main islands of the group a total of 239,012 parasites of which 186,512 were for the fruit-fly and 52,500 for the various dung-flies, as the horn, house and stable-fly.

From the materials collected in the field we have been able to rear all of the introduced parasites of both the fruit-fly and dung-flies except two species, *Dirhinius giffardii* and *Galesus silvestrii* parasites on the pupa of fruit-fly, despite the fact that many thousands were liberated during the last three years.

The usual dissemination of advice regarding pests and diseases of crops or of plants in door-yards was given and much correspondence attended to.

E. M. Ehrhorn,
Superintendent of Entomology.

Honolulu, Hawaii, July 3, 1916.

REPORT OF THE

Division of Animal Industry

OF THE BOARD OF AGRICULTURE AND FORESTRY FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

Live Stock Conditions in General.

The past year has probably been unprecedented in so far as prosperity of the live stock and stock breeding businesses are concerned. A few years ago the term live stock or ranching business would have covered everything here to be considered, but more recently the leading live stock raisers have realized that pure bred sires and dams, of whatsoever class of live stock—horses, cattle, sheep or swine—do not necessarily have to be imported, but that they can be produced here equally as well, if not better, than in any other country. As Kentucky, some decades ago, found the blue grass region of that state equal in muscle, bone

and beef-producing properties to any region in the Old Country, so has Hawaii's leading stock raisers realized that once a good foundation was introduced here, no difficulty in maintaining or improving the same need be looked for, and that the exorbitant cost of constantly importing breeding stock might be, if not entirely eliminated, at least confined to the necessity of avoiding inbreeding.

It may, therefore, be claimed, that since the leading ranch owners have emancipated themselves from the time honored, and until quite recently accepted, happy-go-lucky methods of feeding up their pasture crops as climatic conditions provided them, planting little or nothing and making neither hay nor silage, reaction has set in with a will. Pastures have been fenced and seeded, hay and other forage crops conserved, and above all, the value of blood, breeding and pedigree in live stock sent to market has accentuated the necessity of having the best stallions, bulls, rams and boars that money can buy, as their offspring not alone mature quicker, but bring vastly greater returns to the shipper than inferior classes of the same animals.

Under these conditions the islands are becoming more and more self-supplying in so far as meat food products are concerned, while dairy and poultry products still remain far behind. It is more than doubtful whether butter and cheese can ever be produced here in quantities anywhere near sufficient to supply the demand which of late years has been so greatly increased by the large military depots established here. The poultry industry on the other hand has received new life through the discovery and practical application of a simple method whereby the very destructive disease known as sorehead or chicken pox can be both cured and prevented. This disease has been responsible for the almost cessation of poultry raising on a large scale and has caused the prices on fresh island eggs and poultry to soar to respectively, 40¢ to 75¢ per dozen for eggs and 35¢ to 45¢ per pound of live chickens and turkeys. While this disease cannot be said to be the exclusive cause of these conditions, it is generally conceded that ninety per cent. of all chicks hatched after June 1st every year die from it, and that from 25 to 50 per cent. of the earlier hatchings become affected with varying percentages of mortality.

With vaccination however, as it has been practiced here on several thousand chickens, turkeys and squabs, the conclusion is justified that this great loss can be reduced to ten or perhaps five per cent. and evidence is already forthcoming that the local production of eggs and poultry will at least double during the coming year.

Another branch of the live stock industry which has taken a great step forward is hog raising. The large quantities of mess offal (swill) which became available from the numerous military

establishments on the Island of Oahu, provided food for several thousand hogs, and while there is considerable risk of disease resulting from its use, the timely application of hog cholera serum will to a great extent offset the danger of infectious diseases. On the other islands hog raising has likewise increased greatly, especially with the growing and conservation of proper feed crops and the time seems to be near when the Territory will supply its own demand for, not alone fresh pork, but for cured hog products, as ham and bacon.

As in the last preceding years, the military authorities have purchased quite a number of island-raised horses for the use of the cavalry and artillery, and it is doubtful whether better polo horses are bred anywhere in the world than here. The world famous "Carry the News," for which $15,000 was offered in New York, was raised on the Parker Ranch, the sire being a thoroughbred stallion, "Eastertide," while the dam may have been any of forty or fifty mares served by him that season. It consequently stands to reason that there are many more good horses on this ranch, even though they may not all become the best polo performers. The Parker Ranch also produces hundreds of Percheron sired heavy draft horses which are in great demand for plantation work and sell readily at three years old for $225 to $250 per head.

The question of horse supply in case of military emergencies must, therefore, be said to be settled, while the question of feed under the same circumstances remains unsolved. That immense quantities of feed go to waste here in the form of cane tops and molasses, is undisputed, and it is therefore worthy of note that the Hawaiian Sugar Planters' Association, through its experiment station, has now taken up the question of how these products may be utilized with a view to minimizing the immense importations of feed from the Mainland which arrive here by every available steamer.

In regard to live stock diseases the past year has been unprecedentedly favorable to the stock raisers.

Rabies and foot and mouth diseases have remained excluded and neither glanders nor hog cholera have reached us with imported stock. A few scattered cases of glanders appeared in the only district which has remained unprovided with an official veterinarian, but the want has now been filled.

Bovine Tuberculosis.

The suppression of bovine tuberculosis has been continued on the Island of Oahu and has, under authority of a new sanitary code promulgated by the Territorial Board of Health, been extended to the other islands. Results show considerably less infection on Hawaii and Maui than on either Oahu or Kauai. The

total remaining infection may be conservatively estimated as below two per cent. and the ultimate eradication may be considered assured before long.

VICTOR A. NORGAARD,
Territorial Veterinarian.

Honolulu, Hawaii, July 3, 1916.

REPORT OF THE

Division of Hydrography

FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

The following report of operations of the Division of Hydrography is submitted:

SCOPE OF WORK.

In addition to the general investigation of all surface water resources of the Territory, including privately owned as well as water resources owned by the Territory, which has been carried on in coöperation with the U. S. Geological Survey as in the past, the last fiscal year has been notable for the large portion of time and effort given to the investigation of waters owned by the Territory.

Many water licenses and land leases involving comparatively large supplies of Government water, will terminate within the next few years, and equitable renewals or new licenses or leases are very much dependent on the total quantities and seasonal variations of these quantities of the water available under these licenses and leases.

The years of patient effort which have been expended by this organization in collecting hydrometric data, have furnished very interesting and fairly reliable data when these are compared with the annual fees and rentals paid under existing licenses and leases. These data are demonstrating the fallacy of the previous methods used in fixing annual water and land rentals under old licenses and leases, and, although the available records are still very meagre and not what are desired, these are sufficient to show the value of the work being done in this line, and the necessity for continuing the work with a more comprehensive and more intensive scope in the future.

Several of the licensees and lessees of Territorial waters and lands have foreseen the value of keeping reliable records of the available surface water resources during the past decade. The methods used have not always been consistent with the funds ex-

pended, but the records obtained (and freely furnished on request) have proved very valuable when compared and used in conjunction with data obtained by this Division.

Geographically the work has been extended very little and has been limited to the islands of Kauai, Oahu, and Maui,—except for a few rainfall measurement stations which have been established on Molokai and Hawaii.

From the viewpoint of intensity and efficiency, the work on these first three islands has progressed tremendously.

Floods.

The year has been an exceptional one in regard to heavy rainfall, storms, and floods. The months of December and January were notable for four or five heavy Kona storms which were accompanied by the heaviest rainfall recorded since the U. S. Weather Bureau was established in the Territory. These storms resulted in the loss of more than a score of lives on Maui and several deaths on the islands of Kauai and Hawaii. Damage to crops and structures to the extent of hundreds of thousands of dollars also resulted from these storms. A great amount of flood flow data were obtained by this division which will be very valuable in future estimates for bridge, culvert, and flume designs.

Legal Work.

A large amount of hydrometric and other scientific work was done in connection with the Waiakoloa water case, which was tried at Waimea, Hawaii, and Honolulu in July, August, and September, in coöperation with the Attorney General's Department.

Honolulu Water Supply.

The surface stream and ditch measurement work, started during the previous year, relative to the future water supply of Honolulu, was continued on a wider scope than previously, and many special reports thereon were furnished the Governor of Hawaii, the Honolulu Water Commission, and others interested in this problem.

The artesian well records obtained by the Department of Public Works show that, regardless of the heavy rainfall of the past year, the amounts pumped and flowing from the wells have exceeded the supply, and one more year has been deducted from the period which must surely end in a serious water shortage for the city of Honolulu, unless one of the two following courses of procedure is followed:

1. The acquirement or control of all artesian wells in the

Honolulu basin (between Fort Shafter and Diamond Head) by the Territory. (It is estimated that there are about 66 active wells in this area which are discharging, either by being pumped or flowing, about 35 million gallons per day. The total supply used by Honolulu for domestic and municipal purposes at present is about 15 million gallons per day.)

2. The acquirement, transmission, and storage of surface flow.

A small amount of work done at the request of and in coöperation with a member of the City Water Commission resulted in definitely determining that the principal source of leakage from Reservoir No. 4 in the upper Nuuanu Valley is due to a break in the outlet pipe.

A weir and continuous record measurement station was established in May in Hillebrand Glen to determine the actual run-off from this valley.

Military Co-operation.

An investigation of the water resources between Waialaé and Makapuu Pt. was made for the U. S. military authorities. The coöperative stream and rainfall measurement work being done in relation to the water supply of Schofield Barracks was continued during the year.

Other Co-operative Work.

The flood storage investigation being made in coöperation with the Kahuku and Laie plantations was continued. Other coöperative work included about 70 stream and ditch measurement stations, and about 62 rainfall measurement stations on all islands. Many ditch seepage investigations were also made.

Special Reports to the Governor of Hawaii.

Special reports were made at the request of the Governor of Hawaii relative to Honolulu's water supply, the quantities and values of Territorial waters of Kekaha, Waimea, North Wailua, South Wailua, Kapaa, and Anahola on the island of Kauai; the East Maui ditches and the Olowalu and Ukumehame streams on Maui; the Wailuku, Waiakoloa, Waipio, and several other streams and ditches in the Hamakua and Kohala districts on Hawaii.

A comprehensive report as to Territorial water values was also furnished.

Waiahole Tunnel Project.

The Waiahole Water Company's project which was completed in May is the largest of its kind in Hawaii, and cost between $2,500,000 and $3,000,000. Its principal feature is a three-mile tunnel which pierces the Koolau range and transmits the waters

of the windward streams of Kahana, Waikane, and Waiahole to the Oahu Plantation near Pearl Harbor.

* * * * * *

Your attention is invited to the appended tabulations showing the stream, ditch, and rainfall measurement stations maintained during the year.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

STREAM MEASUREMENT STATIONS.

Island	Number of Regular Gaging Stations					No. of private stations and miscellaneous stations	Measurements	
	Maintained on July 1, 1915	Established during fiscal year	Discontinued during fiscal year	Maintained on June 30, 1916	Total number operated during fiscal year		Made at regular stations during fiscal year	Made at miscellaneous points during fiscal year
Kauai	26	3	8	21	29	3	167	16
Oahu	35	0	13	22	35	0	165	5
Maui	35	8	15	28	43	0	108	0
Hawaii	0	0	0	0	0	0	0	14
Total	96	11	36	71	107	3	440	35

DITCH MEASUREMENT STATIONS.

Island	Number of Regular Gaging Stations					No. of private stations and miscellaneous stations	Measurements	
	Maintained on July 1, 1915	Established during fiscal year	Discontinued during fiscal year	Maintained on June 30, 1916	Total number operated during fiscal year		Made at regular stations during fiscal year	Made at miscellaneous points during fiscal year
Kauai	10	8	3	15	18	3	67	10
Oahu	16	2	11	7	18	0	53	49
Maui	7	2	2	7	9	0	25	5
Hawaii	0	0	0	0	0	4	0	9
Total	33	12	16	29	45	7	145	73

RAINFALL MEASUREMENT STATIONS.

Island	Number of Regular Gaging Stations						
	Maintained on July 1, 1915.	Established during fiscal year.	Discontinued during fiscal year	Maintained on June 30, 1916.	Total number stations operated during fiscal year	Total number of private stations for which records are available.	Total number of stations for which records are on file in office for the fiscal year
Kauai	28	2	0	30	30	15	45
Oahu	8	1	0	9	9	3	12
Maui	5	1	1	5	6	15	21
Hawaii	0	0	0	0	0	29	29
Molokai	0	5	0	5	5	5a	5
Kona, Hawaii	6	0	5	1	6	6a	6
	47	9	6	50	56	62	118

Note: a Counted twice; gages are looked after by private parties.

Division of Forestry

Honolulu, Hawaii, August 16, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of July, 1916:

Round Top Forest Reserve.

During the month several trips were made up to Round Top, when the area of government land proposed to be set aside as a forest reserve was shown to three of the Commissioners in order to acquaint them with the land. After the approval of the project by the Board at the meeting of July 26, a notice of public hearing, to be held on August 10, was signed by the Governor.

Forest Reserve Matters.

During the month improvements at the Manoa Ranger Station, Oahu, were begun by building two small culverts, grading the short stretch of road, and by hauling some of the lumber for the ranger station house.

Forest Ranger F. B. Dodge, for the Island of Hawaii, began his duties on July 15, after he had acquainted himself in this office with the forest reserve lands on Hawaii, and had received instructions as to his duties.

Tree planting by Ranger Kaina D. Lovell on the Kealia Forest Reserve, Kauai, and fence construction on the Lualualei Forest Reserve, Oahu, and on Section A of the Olaa Forest Park Reserve on Hawaii, were continued during the month.

On July 23, at the request of the Governor, I accompanied his party to the land of Waimanalo, Oahu, and looked over several land matters in that region. The strip of native forest on and below the cliffs on this land are an important asset to whatever water emanates from this region, and for this reason an investigation will soon be made with the idea of setting aside this forest land as a Territorial forest reserve.

Tree Planting on Mauna Kea.

With the idea of ascertaining the possibility of raising forest trees suitable for lumber, steps were taken during the month for the raising of trees to be planted on the slopes of Mauna Kea, Hawaii. This is a project for which an allotment has been made

and it is planned to begin the experiment first on a small scale before doing any extensive work. Through the kindness of Mr. Alfred W. Carter a small nursery has been started at Keanakolu, and for a beginning seeds of the following timber trees have been sent up for propagation:

Himalayan cypress, *Cupressus torulosa.*
Himalayan Silver fir, *Abies webbiana.*
Norway spruce, *Picea excelsa.*
Benguet pine, *Pinus insularis.*

Seed of the first three species were received from India through the kindness of Mr. J. F. Rock, our Consulting Botanist; the seed of the Benguet pine was sent direct to this Division by Mr. A. F. Fischer, Acting Director of the Bureau of Forestry at Manila, P. I.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

Report of Forest Nurseryman.

Honolulu, Hawaii, August 7, 1916.

The Superintendent of Forestry,
Honolulu, Hawaii.

Dear Sir:—I herewith submit a report of the work done during the month of July, 1916.

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	500	...	99	599
Gratis	...	600	656	1256
	500	600	755	1855

Collections.

Collections on account of plants sold amounted to	$ 3.25
Rent of Office building, Nursery Grounds, for May	35.00
Total	$38.25

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 10,000 in seed boxes and 1,000 in transplant boxes.

Makiki Station.

The work at this Station has been along the lines of building up stock for the coming planting season. There are indications that a great deal of planting of trees will be undertaken when the rainy season begins. Many people are now making inquiries regarding the best trees to plant for windbreaks, firewood and other purposes.

Honolulu Watershed Planting.

The principal work done on lands in the neighborhood of Sugar Loaf and Hering Valley has been hoeing and clearing away grass and weeds from the young trees. The koa trees along the upper slopes of Sugar Loaf are well above the grass and brush and are now able to take care of themselves. The kukui trees planted on the lower slopes and bottoms of gulches are also doing well, but require continual hoeing and clearing away of grass and brush until they get high enough to take care of themselves.

Advice and Assistance.

The writer has been called upon to pay visits and otherwise to give advice and assistance as follows:

Calls made to places in and around the city	13
Advice by telephone	16
Advice by letter	8
	37

Very respectfully,

David Haughs,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, Hawaii, July 31, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of July, 1916, as follows:

During the month there arrived at the port of Honolulu 38 vessels, of which 20 brought vegetable matter and 1 vessel sand. Of these vessels only two passed through the Panama Canal calling here for coal and provisions.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1428	22,910
Fumigated	10	515
Burned	17	18
Returned	9	12
Total inspected	1464	23,455

Of these shipments 23,203 packages arrived as freight, 144 packages as mail and 108 packages as baggage of passengers and immigrants.

Corn, Rice and Bean Shipments.

During the month 29,821 bags of rice arrived from Japan and 2253 bags of beans from Japan and Oriental ports, all of which were found free from weevils and grain moths.

Two lots of corn consisting of 43 bags in one lot and 500 bags in the other arrived on the 15th. As the ruling against the importation of all corn into the United States took effect on July 1st, and as these shipments had left the port of shipment before the time of enforcing the rule, I was requested to ascertain whether or not some allowance could be made in this particular case. I therefore cabled to Washington, D. C., and got a reply that the corn could not enter the Territory. Upon its arrival I found the 500-bag lot to be badly infested with weevils and ordered the same placed in the large fumigating house on Kilauea street where the shipment remained until the day when it was loaded on the Canadian steamer and shipped to British Columbia. The disease (*Sclerospora maydis*) and other closely related forms of downy mildews, for which Quarantine Notice 24 was drawn, not only attacks corn, but also all related species such as Sorghum,

Egyptian corn and Job's tears. If introduced here this disease would cause considerable loss to the farmer. The countries in which these diseases are known to exist are Southeastern Asia, Malayan Archipelago, Australia, New Zealand, Oceanica, Philippine Islands, Formosa, Japan and adjacent islands. Hereafter all corn shipments from these countries, whether as freight or small packages by mail, will be either destroyed or returned to shipper.

Pests Intercepted.

Approximately 1,840 pieces of foreign baggage were examined during the month, principally at the U. S. Immigration station, and 15 packages of fruit and one package of vegetables were found, seized and destroyed by burning.

Five pine trees and 4 ornamental plants were refused a landing from a Japanese freighter calling at this port. A package of Gladiolus bulbs was fumigated on account of the bulbs being infested with the bulb aphis. Two packages of palm seeds in the mail from India were treated with carbon bisulphide before delivery. One package containing 6 pineapple plants arrived by mail from Queensland for the Hawaii Experiment Station. These were carefully examined by Dr. Lyon and myself and were fumigated on account of the common mealybug (*Pseudococcus bromeliae*). The pineapple plants are held in quarantine under our supervision at the Hawaii Experiment Station, isolated from other plants and will remain so until we are satisfied that no disease will develop on them.

A box of Orchids from New Jersey with a few plants infested with scale (*Aspidiotus cyanophylli*), 1 fern in the mail from Ohio infested with scale (*Heinichionaspis aspidistrae*) and (*Saissetia himisphaerica*) were fumigated before delivery. One package of dried peas in the mail infested with the pea weevil (*Bruchus pisorum*) and 2 packages of rice seeds from Japan were fumigated with carbon bisulphide before delivery. One package of tree seeds from India for the Hawaii Experiment Station, which was infested with weevils, was fumigated before delivery. One package of tree seeds and 1 package of mango seeds from Manila as well as 1 package of tree seeds from Japan were returned by the U. S. Post Office as unmailable under ruling of the Federal Horticultural Board.

Hilo Inspection.

Brother Matthias Newell reports the arrival of 7 steamers during the month, of which 4 brought vegetable matter consisting of 176 lots and 2,338 packages, all of which was found free from pests and was passed for delivery.

Owing to the usual vacation granted to Brother Newell each

year I left Honolulu on July 8th to take charge of the work during his absence. I found his work in good shape and everybody seemed pleased. During my stay I liberated a number of the melon-fly parasites (*Opius fletcheri*) for Mr. Fullaway as I had a good opportunity to do this between steamer arrivals.

Inter-Island Inspection.

Sixty-two steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	585	bags
Plants	109	packages
Vegetables	97	"
Fruit	17	"
Total passed	808	"

The following packages were refused shipment as they did not pass the regulations pertaining to soil and infestations:

Fruit	11	packages
Plants	20	"
Total refused	31	"

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, Hawaii, July 31, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—Permit me to report on the operations in the Insectary during the month of July, 1916:

On account of the large amount of work connected with the new melon-fly parasite, we have had to abandon the propagation of all of the fruit-fly and dung-fly parasites that we know to be established. We are, therefore, now running only the two pupa parasites, *Tetrastichus,* and the melon-fly Opius.

During July two lots of *Tetrastichus* were liberated, one of 150 at Pearl City and another of 200 at Hana, Maui. A lot of 50 *Dirhinus* were liberated at Pearl City.

During the month of July there were produced 1485 female and 674 male individuals of the new melon-fly parasite, *Opius fletcheri.* Liberations were as follows:

Pearl City	31
Manoa	86
King and Kalakaua	169
Moiliili	310
Kailua	123
Waialua	64
Hilo	267
Kapoho	132
Molokai	150
Hana	68
Wailuku	121
Lihue	138
Koloa	59
	1718

On the last day of the month Mr. Herbert Osborn of the Hawaiian Sugar Planters' Association staff arrived from Manila with the egg parasite of the corn leaf-hopper mentioned in a recent report to the Board. As the new quarantine room at this station offered the securest place for handling these parasites, and as Mr. Osborn's time was largely preëmpted by caring for other parasites more directly connected with the work of the sugar planters, the leaf-hopper parasites were brought to this station and the writer is assisting Mr. Osborn in taking care of their

propagation and distribution. In the next report the details of this work can be given and very likely some definite word as to the establishment of the parasite.

Very truly yours,

DAVID T. FULLAWAY,
Entomologist.

REPORT OF D. T. FULLAWAY: SEARCH FOR MELON FLY PARASITES.

Honolulu, Hawaii, June 20, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—Permit me to report my return, on May 10, with a small lot of *Opius fletcheri*, a parasitic wasp living at the expense of the melon fly and behaving in much the same way as the braconid fruit fly parasites obtained in Africa and Australia. An effort was made immediately to multiply the parasites in order to secure their establishment in the Islands, and it is gratifying to be able to state that in all probability we will be successful in this endeavor, as the parasites in the first generation multiplied sixfold, and the succeeding generation now coming on should provide material for liberation. At the end of fifteen days' rearing, to safeguard the introduction, the four remaining females of the original lot were taken to Kona and liberated in a particularly favorable spot among wild Chinese cucumbers.

Before going on to the detailed account of the expedition, it should be stated that when the search for melon fly parasites was begun last July, our knowledge of the fly outside of Hawaii was very limited, consisting almost wholly of the probable distribution of the fly gained from the meager records of Compere and Muir and the publications of the Imperial Entomologist of India. Nothing positive was known of parasites, although Muir's accounts of the relative scarcity of the fly in certain localities gave a measure of confidence to the assumption that parasites existed.

In regard of the facilities offered by the government laboratories in India, it was considered that *it* would be the country to work first, and on July 23 I set out with the intention of going directly to Pusa in India. When I reached Manila, however, I went up to Los Baños to have a conference with Muir, and it was largely on his recommendation that I decided to work first around Singapore.

While at Hongkong, August 17-20, on my way to Singapore, I made a short trip up the river to Macao, where Muir and Ker-

shaw had worked considerably, to determine its suitability as a breeding station on my probable return with parasites.

Leaving Hongkong on the 20th, I arrived at Singapore on the 26th, located a supply of infested fruit in some Chinese vegetable gardens, and set up my laboratory in a room over the hotel garage. Here I worked over a month, rearing melon flies out of cucumbers and a few momordicas and luffas. At the end of a week on opening some of the puparia, I found a single female Opius, and shortly after two males, and felt encouraged to go on. However, although more than 6,000 flies were reared, no further parasites were obtained, and I decided to continue on my way to India. I attribute the meagre results obtained in Singapore to the character of the fruit used, and the manner of its cultivation. The only cultivated cucurbit to be obtained in any quantity is the cucumber, which is produced by Chinese market gardeners under conditions which are very favorable to mold—the ground where these gardens are is low, and it is the custom of the Chinese to wet down the beds three or four times a day with liquid manures. I think if wild momordicas could have been obtained, the parasites would have been more abundant, but under the conditions described, the parasites have little chance to multiply.

At Singapore I had the misfortune to lose part of my equipment and I utilized the time necessary to have it replaced in investigating melon fly conditions in Java. It is only a 36-hour run from Singapore to Batavia, and another 3-hour journey on the railroad to Buitenzorg, the seat of government and location of the scientific laboratories. The director of the scientific work, Dr. Konigsberger, showed sympathetic interest in my mission, and kindly offered me a desk in the Strangers' Laboratory. I spent nearly a month in Java, October 10 to November 6, and in this time reared between 4,000 and 5,000 flies. In due course the material disclosed the parasite found at Singapore, and I was able to take a small lot of males and females away with me. My time in Java was limited, and the work done there was done too hurriedly to give anything more than an impression of the conditions, but the impression was very favorable. Cultivated fruit was scarce at that season of the year, and momordicas were used very largely in rearing flies. These fruits are not cultivated in fields or gardens, but are grown by the natives around their houses, and are, therefore, very much scattered. The cultivated fields appeared clean, and I was told that two pickings are usually secured before an infestation is noticed. A large ground beetle was very active here.

On returning to Singapore, I found a letter from Muir giving encouraging information in regard to the Philippines, but I had already made my plans to go to India, and was obliged to defer the investigation of this new field till later.

Leaving Singapore on the 9th of November, we arrived at Negapatam on the 16th, and from there I proceeded by rail to Bangalore, in Mysore State, a locality highly recommended by Compere. I may say that the idea of going to Pusa had to be abandoned on account of the low temperatures prevailing there during the winter months. I found Bangalore suited to my purposes, although it is not, as I had expected it to be, in a rich agricultural or fruit-growing section; it is really one of the hill stations of India, in normal times with a garrison of more than 10,000 troops, and on account of its fine climate, has attracted many Indian pensioners. It was natural, therefore, to find on the outskirts of the city extensive gardens, and my first examination of these revealed the melon fly. I utilized a small room in the hotel as a laboratory, and was soon rearing hundreds of flies. Before I had a chance to breed the parasites brought from Java, the same species appeared in Indian material, and in a very short time I had a flourishing colony. I spent five weeks or more in India, rearing about 10,000 flies. Out of these *Opius fletcheri* came abundantly, and I was also able to cultivate a small lot of *Spalangias;* but nothing further appeared, and after my own extensive work and the assurance of Mr. Fletcher, the Imperial Entomologist, that nothing else had ever been bred by them from *D. cucurbitae,* I decided I had exhausted this field and it was time to move on to the Philippines. All the while in India I was looking closely for *Syntomosphyrum indicum,* the fruit fly parasite introduced by Compere into Australia, by Lounsbury into the Cape, and by Silvestri into Italy, but I saw nothing of it, and the Indian Entomologist could give me no information about it beyond what I already knew.

Leaving Bangalore on the night of December 23 for Colombo, I was detained by the Indian police at Dhanuskodi for three days *en route,* but arrived in ample time to catch the Spanish mail December 31, and after an uneventful voyage of 18 days reached Manila with about 75 living examples of the Indian parasite, *Opius fletcheri,* which I had carried with me on leaving India. While stopping in Singapore I had also secured infested fruit to breed the parasites en route, and from this material I subsequently got 64 additional individuals.

In Manila I received very generous assistance from the Bureau of Agriculture and Science, and established a laboratory in a room set aside for me at the latter institution. I found fruit very scarce and practically no cultivated cucurbits. Under the circumstances I was obliged to depend entirely for rearing and breeding purposes on momordicas. These fruits are dry and do not give the same trouble with regard to mold that cucumbers do; at the same time they contain very few maggots, and are got only with great exertion and loss of time. As a consequence my stock of parasites dwindled, and I was disappointed in the hope

of finding additional species. I spent nearly three months in the Philippines, rearing about 18,000 flies, but nothing new disclosed itself. This seemed strange in view of the rich fruit-fly fauna there, which is known to harbor several species of opiine parasites. I also lost the small colony of Spalangia, one generation running to males.

While in Manila, Mr. Osborne of the Planters' staff, called my attention to the heavy parasitism suffered by the corn leaf-hopper in the Philippines. One particular parasite, a Mymarid, seemed especially effective, and I undertook to introduce it into Hawaii, keeping a well-stocked cage of it going for a month before my departure. It was unfortunate that at the time of leaving Manila, the steamer connections were such that I was obliged to remain in Hongkong a week. I used this intermission in the voyage to the best advantage, but my fruit-fly parasites had dwindled to very small proportions by the time of my arrival in Honolulu, and the leaf-hopper material went utterly bad before getting as fas as Shanghai. It was really too early in the season to bring corn plants through. This parasite and another chalcid, which is known to parasitize the corn hopper, should ultimately be brought here, as in the Philippines they prove an effective check on the hopper.

As previously stated, since reaching Honolulu the melon fly parasites have multiplied, and the introduction is practically assured, but the original task of finding enemies of the melon fly which will prove an effective control of the pest, is far from accomplished. Before making further recommendations, it is necessary to study the problem thoroughly from several different angles, and it is probable that the advice of Professor Silvestri and other specialists would give more light on the nature of the work and the best methods for its accomplishment.

Very respectfully,

D. T. Fullaway,
Field Entomologist.

Division of Animal Industry

Honolulu, Hawaii, August 21, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit the following report for the Division of Animal Industry for July, 1916:

Sore-head or Chicken Pox.

The demand for sore-head vaccine continued to increase, more than two thousand doses being distributed or applied to infected flocks during the month, with highly satisfactory results. This method of treatment may now be accepted as safe and effective with all classes of chickens more than four to five weeks old. Such young birds do not seem to have the resistance or vitality required for the treatment, in fact, they seem to benefit little, if at all, from it. The point is, therefore, to guard the chicks against infection and this can easily be done by keeping them in brooders or boxes raised above the ground. So long as such young birds are not turned out on infected ground they will not easily develop the disease, and if one or more should show symptoms, it will be noticed at once and quick removal will protect the rest, as the disease does not seem to be very contagious until the scabs are ready to drop from the sores.

A visit to the splendid Minorca breeding plant of Mr. H. F. Fisher, near Olaa, Hawaii, is proof sufficient of the value of sore-head vaccination. It will be remembered from former reports, that Mr. Fisher last year lost more than one hundred pullets in less than two weeks, and that he felt convinced he would have lost practically all of the remaining 200, had it not been for the timely application of the vaccine. Mr. Fisher recently was kind enough to place at my disposal 100 head of culls for experimental purposes. These birds had not been vaccinated and, unfortunately, the disease broke out among them in a most virulent form so that upon my arrival at Olaa only forty remained alive, and at least half of these were so badly affected as to make them useless for the planned experiments. Among these birds the lesions were, for the first time, observed on both wings and shanks, besides the usual location on head and necks. About twenty-five of the forty survivors were saved by ordinary double vaccination, which, considering the unusual malignant form the disease had assumed must be considered a very good percentage. What would have happened to Mr. Fisher's poultry enterprise, except for the vaccine which had been applied to all of his sev-

eral hundred purebred birds before the disease made its appearance this spring, is not pleasant to contemplate. As it is, Mr. Fisher is now on the way to the Coast to purchase five hundred additional birds, sore-head notwithstanding.

Kidney Worm in Hogs.

While in Hilo an opportunity to investigate the circumstances surrounding the fatal outbreak of kidney worm, reported by Dr. Elliot last month, offered itself. That this disease is not confined to hogs kept on slaughter house offal and in highly unsanitary conditions, was fully proven. The parasite was, in fact, encountered in hogs living under ideal conditions, that is, the wild or half-wild hogs which roam by the thousand on the upper slopes of Mauna Kea. Without exception, every hog killed on the south side of the Puu Oo hill and the upper branch of the Wailuku River appear to be more or less infected with the worms, and the possibility of the infection reaching Hilo by means of the river is not excluded. Live hogs cannot be transported from this remote vicinity to the lowlands except on pack mules, which, of course, is not done; but as the Wailuku River has its origin on the Puu Oo divide, where the infected hogs were seen in at least one of its branches in large numbers, and where post-mortems were made and the worms found, the conclusion seems justified that the heavy infestation of the hogs at the slaughter house near Hilo may have originated on the upper reaches of Mauna Kea.

The life history of this worm is not known. It infests the abdominal viscera of hogs and is most frequently found in the kidney fat, or in the kidney itself, and more rarely in the liver and other organs. In one case at least, nearly half of one kidney was found transformed into abscesses and cysts which, upon isolation, showed numerous worms in various stages of development. That some part of the worm's life cycle is spent outside the hogs, is undisputed, and that some other host (possibly the earth worm) assists in the development of the parasite, is highly probable, but beyond these surmises nothing is known, not even the manner in which the infection (eggs or larva) leave the original host.

In the meantime it is futile to suggest measures for the control of the parasite beyond the boiling of all slaughter house offal, while medicinal treatment is absolutely excluded, owing to the habitat of the worms in organs and tissues inaccessible to ordinary treatment.

Forage Poisoning of Hogs on Maui.

From the appended report of the Assistant Territorial Veterinarian, it will be seen that a number of hogs were lost on Maui as a result of feeding badly moulded corn. This is one of the

first cases recorded of hogs succumbing to the so-called cerebro-spinal meningitis, and proves that it is not always safe to feed grain which has caused the death of horses and mules, to hogs, a method often resorted to in order to save the total loss of badly harvested feed. As a rule hogs will do well on grain or other forage which is sure death to horses, but it stands to reason that there must be some limit, which indeed seems to have been reached in this case. Whether such badly spoiled feed can be rendered innocuous by boiling, must be proven in each case and should not be taken for granted. The poisons produced in the grain by certain moulds and fungi do not necessarily change their chemical composition or properties even when the fungus or mould has been killed by moist heat, and caution is therefore advisable in all cases where the use or disposal of mouldy feed is considered.

Quarantine Station.

An unusually large number of dogs have arrived here of late, so many in fact, that all the kennels in the dog division are full, and several have more than one occupant. As I am apprised of the arrival of several more dogs in the near future, it seems to me advisable that the station be enlarged to meet the requirements. The continued demand for mosquito proof kennels for toy and pet dogs belonging to tourists or temporary visitors, also makes it desirable that such quarters be provided. A tentative plan and estimated cost have been submitted to the Executive Officer of the Board.

Very respectfully,

Victor A. Norgaard,
Territorial Veterinarian.

Report of Assistant Veterinarian.

Honolulu, Hawaii, August 17, 1916.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry,
Board of Agriculture and Forestry,
Honolulu.

Sir:—I beg to submit the following report for the month of July, 1916:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	Tested	Passed	Condemned
John Gomes	71	69	2
Chas. Frazier	8	8	0
Salvation Army Home	7	7	0
W. P. Alexander	4	4	0
K. Mitsuwaga	4	4	0
Kawaiahao Seminary	22	21	1
Sam Kanakanui	5	5	0
Kualoa Ranch	389	387	2

From the above list it will be seen that 510 cattle were tested, out of which number 505 were passed and 5 condemned and branded. All of the above condemned cows have been slaughtered.

Post-Mortem Examinations.

Cow condemned July 17: slaughtered at C. Q. Yee Hop's abattoir: Lesions: small recent nodule in one mediastinal gland.

Chicken-pox or Sorehead.

During the past month 2450 c.c. of chicken-pox vaccine has been prepared and used among the flocks of the City and County with most excellent results.

It has been found by experiment that the least amount of carbolic acid which will preserve the vaccine is 1 per cent. This percentage, apparently, will keep the vaccine indefinitely and so far no detrimental effects have been observed.

Food Poisoning on Maui.

In response to a wireless from Dr. J. C. Fitzgerald, and at the direction of the President and Executive Officer of the Board, I left for Maui to investigate a peculiar condition among hogs on the Haleakala Ranch.

History: The herd consisted of about sixty-five head, large and small. For the past few weeks previous to my arrival, several hogs had died, symptoms before death resembling hog cholera. Dr. Fitzgerald administered large doses of anti-hog cholera serum without results, as deaths still continued to occur.

Symptoms: The symptoms as observed were, in the first stages, high fever, rapid breathing, all food refused, a disinclination to get up, and when aroused, a weak staggering gait; in the final stages, complete paralysis of hind parts with more or less complete paralysis of the larynx and pharynx, and not being able to swallow the saliva drooled from the mouth, and in a short time death would take place. At no time were any red spots

observed on the surface of the body, as in hog cholera. There was no regular space of time between first appearance of symptoms and death, some of the younger pigs—four to five months—died in a day or two, the old sows lingered along for four or five days or a week.

Post-Mortem Examination.

Upon my arrival I went at once to the ranch with Dr. Fitzgerald and two post-mortems were made; one on a sixty or seventy-pound pig which had died the night before and one of similar size which we found in a dying condition. In these two animals there wasn't a lesion of any kind. No evidence of hog cholera, or any abnormal condition in any of the internal organs. The only thing noticed was that the kidneys were somewhat paler than usual, due perhaps to the fever.

An inspection of the remaining animals in the pens revealed five more sick ones. A large part of the healthy ones had been removed by Dr. Fitzgerald to new quarters, and a complete change of diet ordered, and with the exception of one sow, which was taken sick just after removal, no symptoms appeared or deaths occurred among this number segregated.

It was decided to allow a few days to elapse so as to give an opportunity for lesions to develop in those sick. Consequently, on the following Monday five hogs, in a now dying condition, were killed and careful post-mortem examinations made. The results were, as in the other two, no lesions of any kind throughout the entire thoracic and abdominal viscera.

Upon opening the brain it was found that there was a slight thickening of the covering membranes which were more adherent to the cranial cavity than normally. The brain itself was very much congested. There was a slight increase of the ventricular fluid, and the floor of the fourth ventricle was exceedingly congested. The membranes of the spinal cord were thickened and congested.

Diagnosis. The above outlined symptoms and post-mortem findings strongly suggested a forage poisoning of some kind, and with that idea in view we carefully examined all the feed. The diet consisted of wheat middlings, cane tops and molasses and corn on the cob. Everything was found in excellent condition but the corn. This corn had been purchased by the ranch some time before and was not properly cured in the first place, and was now permeated throughout with all kinds of mould. Not only were the cobs mouldy, but individual kernels could be easily broken and shown to be filled with a green powdery mould. This serious condition of the corn, which was absolutely unfit for food, together with the fact that no sickness occurred among those hogs segregated and to which no corn was given, would seem to in-

dicate that this particular portion of the diet was responsible for all the loss which had occurred.

Dr. Fitzgerald's tentative diagnosis of a form of cerebro spinal meningitis or forage poisoning would seem to be fully established by the above symptoms, post-mortem findings and condition of the feed.

Prevention: Complete change of location and, as far as possible, complete change of diet and strict attention to the condition of the feed used.

Importation of Live Stock.

S. S. Wilhelmina, San Francisco—12 cts. poultry.

S. S. Manoa, San Francisco—1 dog, Capt. J. W. Crawford; 22 cts. poultry.

S. S. Niagara, Vancouver—1 dog, Mrs. Richardson-Jones.

S. S. Matsonia, San Francisco—1 dog, Mrs. de Temple; 1 dog, W. F. Ex. Co., 32 cts. poultry.

S. S. Lurline, San Francisco—44 mules, Schuman Carriage Co.; 1 Hampshire sow, J. H. Wilson; 35 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, August 9, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—The following report of operations of the Division of Hydrography during July, 1916, is submitted:

Weather Conditions.

With the exception of the third week in the month, during which abundant heavy showers fell on Hawaii, Oahu, and part of Maui, the month was one of light rainfall. Frequent light showers kept vegetation in good condition, but generally streams and ditches are drawing down to a very low flow. Flood storage reservoirs generally contain very little water. No. 4 Reservoir of the City of Honolulu on July 31 had but 26 feet of water in it.

Kauai Flood Storage Reconnaissance.

The upper valleys of the North Wailua, Kapaa, and Anahola basins were visited and several possible flood storage reservoir sites worthy of further investigation were found at elevations of from 400 to 700 feet above sea level.

A similar investigation will be made in the headwaters of the Waimea River in September.

Territorial Water Commission Work.

The services of Assistant Engineers R. C. Rice and R. D. Klise during the month were entirely devoted to work for the Territorial Water Commission. A considerable part of the time of the Superintendent, who is chairman of this commission, was also expended on this work.

Operation and Maintenance Work.

Kauai. Ten days were spent in collecting and checking coöperative ditch run-off and rainfall records for the fiscal year ending June 30, 1916.

The Lumahai River measurement station was overhauled and repaired.

A new coöperative ditch measurement station was established on the Kuna ditch near Hanalei.

Thirty-six stream and ditch, 17 rainfall, and 5 evaporation

measurement stations were visited. Twenty-two stream and ditch discharge measurements were made.

Oahu. Eighteen stream and ditch and 3 rainfall measurement stations were visited and 5 discharge measurements were made.

Maui. Five days were spent collecting coöperative ditch discharge and rainfall data.

Thirty-one stream and ditch and one rainfall measurement stations were visited and 21 discharge measurements were made.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF HONOLULU, ISLAND OF OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said laws provided, do hereby set apart as a forest reserve to be called the ROUND TOP FOREST RESERVE, subject to existing rights, a portion of that certain piece of government land called Makiki in the District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, containing a net area of 115 acres, more or less, more particularly described by and on maps made by the Government Survey Department of the Territory of Hawaii, which said maps are now on file in the said Survey Department marked Government Survey Reg. Map No. 2521, and "Round Top Forest Reserve" and a description accompanying the same numbered C. S. F. No. 2628, which said description now on file in said Survey Department is as follows:

ROUND TOP FOREST RESERVE,
Honolulu, Oahu.

Beginning at a U. S. Military Reservation monument at the north corner of this land, said monument being by true azimuth and distance 48° 00′, 231.2 feet from the Government Survey Trig. Station "Kakea," and running by true azimuths:

1. Southwesterly along top of ridge along Makiki Park and Reservation to a pipe, the direct azimuth and distance being: 27° 27′ 1059.0 feet;
3. 47° 47′ 1249.0 feet along Makiki Park and Reservation to a pipe;
3. 47° 47′ 1240.0 feet along Makiki Park and Reservation to a pipe;
4. 40° 58′ 1293.5 feet along Makiki Park and Reservation to a point on the upper side of Round Top Drive, said point being 220° 58′ 69.5 feet from a pipe at the North corner of Lot 825 of Makiki-Round Top Lots;
5. Thence along the upper side of Round Top Drive along a curve to the left with radius of 112.0 feet, the direct azimuth and distance being: 337° 52′ 106.6 feet;
6. 309° 27′ 280.1 feet along upper side of Round Top Drive;
7. 299° 27′ 88.6 feet along upper side of Round Top Drive;

8. Thence still along upper side of Round Top Drive on a curve to the right with radius 534.0 feet, the direct azimuth and distance being: 310° 47′ 209.9 feet;
9. 322° 07′ 116.6 feet along upper side of Round Top Drive;
10. Thence still along upper side of Round Top Drive on a curve to the left with a radius of 215.0 feet, the direct azimuth and distance being: 279° 43′ 290.0 feet;
11. 237° 19′ 70.8 feet along upper side of Round Top Drive, the true azimuth and distance from this point to the Northeast corner of Lot 820 of Makiki-Round Top Lots being: 327° 19′ 50.0 feet;
12. Thence still along upper side of Round Top Drive to a 1½ inch pipe, the direct azimuth and distance being: 230° 43′ 2787.6 feet;
13. 226° 30′ 554.0 feet to a 1½ inch pipe;
14. 142° 35′ 38.0 feet along Land Court Petition 157 to a 2-inch pipe;
15. 225° 00′ 164.0 feet along Land Court Petition No. 157;
16. 216° 36′ 148.0 feet along Land Court Petition No. 157;
17. 197° 10′ 65.8 feet to a 2-inch pipe;
18. 214° 14′ 167.6 feet along Land Court Petition No. 152;
19. 200° 18′ 163.2 feet along Land Court Petition No. 152 to a 2-inch pipe;
20. 201° 41′ 182.6 feet;
21. 120° 00′ 100.0 feet;
22. 165° 50′ 330.4 feet;
23. 166° 24′ 40.1 feet across road;
24. 141° 05′ 124.5 feet along 20-foot U. S. Military right-of-way;
25. 124° 55′ 222.6 feet along 20-foot U. S. Military right-of-way;
26. 105° 00′ 158.3 feet along same;
27. 76° 29′ 150.2 feet along U. S. Military Reservation to a U. S. monument;
28. 92° 45′ 159.0 feet along U. S. Military Reservation to a U. S. monument;
29. 147° 37′ 90.0 feet along U. S. Military Reservation to the point of beginning.

Area 118 90-100 Acres.

Excepting and excluding therefrom, however, the U. S. Military Reservation on Round Top Hill and 20-foot right-of-way thereto, as described in War Department General Order No. 200, dated December 10, 1908, (area 3.9 acres), LEAVING A NET AREA OF 115.00 ACRES.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 10th day of August, A. D. 1916.

(Signed) LUCIUS E. PINKHAM,
Governor of Hawaii.

TERRITORY OF HAWAII

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

RULE IX

DIVISION OF ANIMAL INDUSTRY

Rule and Regulation of the Board of Commissioners of Agriculture and Forestry Concerning Hog Cholera and Other Diseases of Swine.

In order to prevent the spread of hog cholera, swine plague, contagious pneumonia and other infectious, contagious, and communicable diseases

of swine, the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation:

Sec. 1. It shall be the duty of the owner, agent, keeper, or other person in charge of or in any way connected with the keep or care of swine, to report, without delay, to the Territorial Veterinarian, his Assistants or Deputies, the appearance among such animals of any disease or symptoms of disease which he knows or has reason to believe is of infectious, contagious or communicable nature.

Sec. 2. Pending the arrival of the Territorial Veterinarian, his Assistant or Deputy, said owner, keeper, or person in charge shall immediately segregate the sick or suspicious animals, preferably, if possible, by removing the unaffected animals to a safe distance on higher ground and to the windward of the diseased animals, and shall take every possible precaution to prevent the further spread of the disease to either his own or his neighbors' animals.

Sec. 3. Animals which have died shall, if conditions permit, be kept for a reasonable time in order to aid the veterinarian in diagnosing the disease, but the carcasses must be removed to a place on low ground convenient for burial, and be covered with sacks saturated in a five per cent solution of carbolic acid, creolin or other strong disinfectant, or with lime. A grave five feet deep shall be dug or firewood provided for the immediate disposal of the carcasses after examination.

Sec. 4. All dogs, cats, poultry and, so far as possible, mynah birds and other scavengers shall be kept away from the carcasses of dead animals and the infected premises.

Sec. 5. No visitors shall be allowed on or near the infected premises, nor shall the owner, keeper, or any other person leave the same without first cleaning and disinfecting his shoes and hands and removing or exchanging contaminated garments.

Sec. 6. Until a definite diagnosis has been made by the Territorial Veterinarian, his Assistant or Deputy, and definite instructions issued by him, no hogs shall be allowed to leave the premises. The same applies to all litter and manure, as well as to stable and farm utensils which have been used on or near the infected premises. The hoofs of driving or riding animals and the wheels of wagons, trucks or automobiles shall be washed and disinfected before leaving the same.

Sec. 7. Upon the arrival of the Territorial Veterinarian, his Assistant or Deputy, the owner, keeper or person in charge shall assist him in investigating the nature, cause and origin of the disease to the best of his ability, and shall coöperate with him in suppressing and eradicating the infection. If necessary, in the judgment of the Territorial Veterinarian, his Assistant or Deputy, he will declare a quarantine upon the infected premises and will issue such instructions as in his judgment are required to make the same effective. All such instructions that pertain to segregation, destruction or disposal of animals diseased beyond recovery or dead, disposal of manure and infected bedding, disinfection and whitewashing, testing and inspection of diseased or exposed animals must be complied with implicitly. In regard to the treatment of the diseased and exposed animals the owner, keeper or person in charge may call into consultation or employ any veterinarian licensed to practise under the laws of the Territory, or may treat or vaccinate his own animals, so long as such consultation, treatment or vaccination meets with the approval of the Territorial Veterinarian, his Assistant or Deputy and does not conflict with the policies of the Board of Agriculture and Forestry or with the laws of the Territory.

Sec. 8. The appended order of quarantine shall become effective immediately upon its promulgation by the Territorial Veterinarian, his Assistant or Deputy, and as soon as detached, delivered to and receipted for by the owner or manager of the infected premises, specified therein.

Sec. 9. When quarantine has been established by such order, it shall remain in effect until revoked in writing, and no permit to remove any or all of the animals or articles specified in the quarantine order shall become effective until issued in writing by the Territorial Veterinarian, his Assistant or Deputy.

Sec. 10. Immediately upon the establishment of quarantine the premises shall be posted conspicuously by means of suitable placards and the same shall remain in place until removed by the Territorial Veterinarian, his Assistant or Deputy, or by his order.

This rule shall take effect on the first day of September, 1916.

Approved this eighth day of August, 1916.

LUCIUS E. PINKHAM,
Governor of Hawaii.

Any violation of this regulation is a misdemeanor and punishable by a fine not to exceed $500.00. (See Sec. 529, Revised Laws of Hawaii of 1915.)

TERRITORY OF HAWAII

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

Further amendment to Rule XVIII of the Division of Entomology of the Board of Commissioners of Agriculture and Forestry concerning the Control of Fungus Diseases on Pineapples.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby further amends Rule XVIII of the Division of Entomology concerning the control of fungus diseases on pineapples in order to permit the shipment of pineapple fruit only from Honolulu to ports on the Island of Hawaii so that the said rule shall read as follows:

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation for the purpose of preventing the spread of a fungus disease upon pineapples which has made its appearance upon the Islands of Kauai and Oahu:

Section 1. All persons and corporations are hereby prohibited from carrying, transporting, or shipping from the Islands of Kauai and Oahu to any other Island in this Territory any pineapple fruit, pineapple plant, or pineapple sucker; provided, however, that clean pineapple fruit may be shipped from Honolulu to ports on the Island of Hawaii.

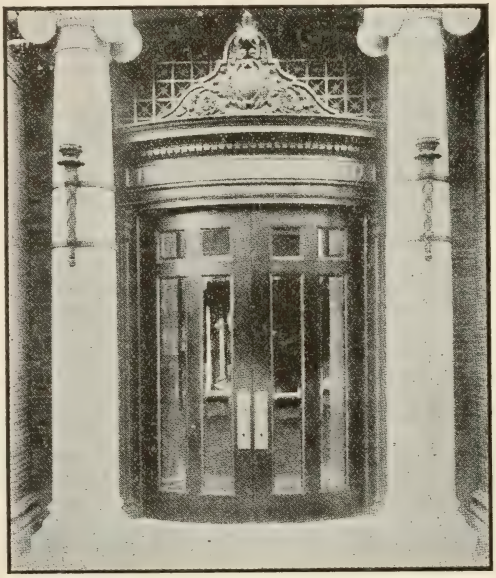
Section 2. No pineapple fruit, pineapple plant, or pineapple sucker shipped from any port of the Islands of Kauai and Oahu to any other port in this Territory, excepting clean pineapple fruit shipped from Honolulu to ports on the Island of Hawaii shall be allowed to be landed. Inspectors and other duly appointed agents of the Board of Agriculture and Forestry are hereby empowered to examine and inspect all freight, baggage, and belongings arriving at any port of the Territory from the Islands of Kauai and Oahu and to destroy any and all pineapple fruits, plants or suckers, excepting clean pineapple fruit arriving at ports on the Island of Hawaii from Honolulu, found among such freight, baggage or belongings.

Section 3. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed Five Hundred ($500.00) Dollars as provided by Section 529 of the Revised Laws of Hawaii of 1915.

Section 4. This Rule, as amended, shall take effect upon its approval by the Governor.

Approved this 2nd day of September, 1916.

LUCIUS E. PINKHAM,
Governor of Hawaii.



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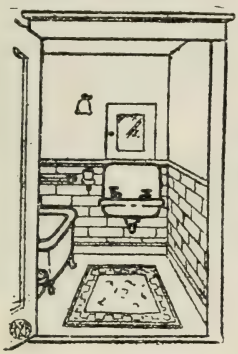
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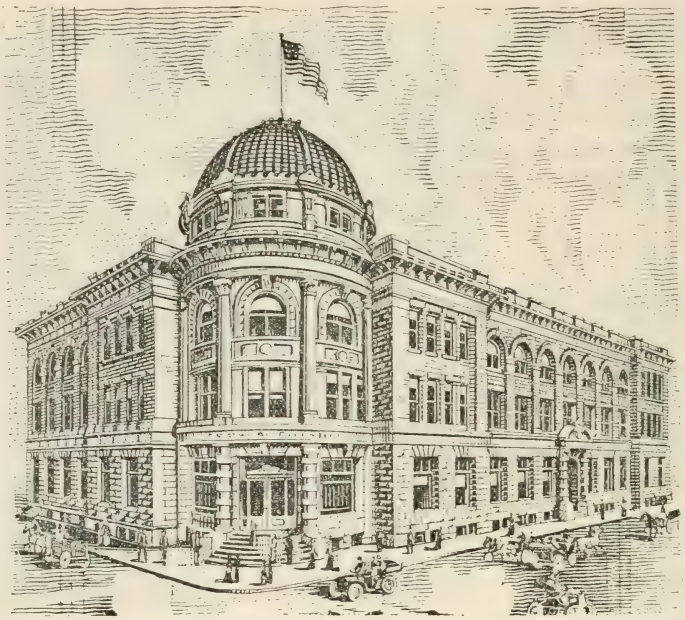
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THE HAWAIIAN FORESTER AND AGRICULTURIST

SEPTEMBER, 1916

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

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To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

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G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, SEPTEMBER, 1916. NO. 9

The setting apart of the Round Top Forest Reserve, Oahu, by proclamation of the Governor on August 10, 1916, brings the total area of land in forest reserves up to 798,344 acres. Of this amount 546,352 acres, or over 68%, is government forest land.

The time for another Arbor Day celebration approaches and it is hoped that this event, to be celebrated in November, will be as successful as it was last year.

The young trees and seeds brought by the consulting botanist, Mr. J. F. Rock, who returned on September 6 from a trip to Java and the East Indies, and the Philippine Islands, and the young ornamental and forest trees which are now being raised at the Government Nursery from seed obtained by mail from Madagascar, India, Australia and the Philippines should have a marked effect in the improvement of areas where trees of this character are now lacking.

It is fortunate that the insects have left the ripening koa seeds alone long enough this summer to permit the gathering of 35 pounds of clean seed in the neighborhood of Tantalus. This supply will last the Division of Forestry for several years. The koa is an easy tree to raise from seed and being indigenous is well adapted for use in the reforestation of our bare ridges and well drained slopes.

The success attained in breeding and distributing the corn leaf hopper parasite is very encouraging and the beneficial effect of this introduction should soon be noticed by the corn planters throughout the Territory.

The First Algaroba and Royal Palm in Hawaii

By C. S. Judd, *Superintendent of Forestry.*

The American Genetic Association of Washington, D. C., recently awarded two prizes of $100 each for the location of the largest nut-bearing and non-nut-bearing hardwood trees in the United States. The contest required the submission of photographs and actual measurements, and resulted in the assembling of much interesting data in regard to the largest trees of these two classes. A valley oak in San Benito County, California, was found to be the largest nut-bearing tree and a sycamore near Worthington, Indiana, the largest hardwood tree of the other class.

I wish that there might be instituted in Hawaii a similar contest for the purpose of determining the location and the history of introduction of the first tree of the many species that have been successfully raised in these Islands. At any rate, in order to stimulate interest in this subject, which may induce others to send in information of historical and botanical value concerning introduced trees, it is the purpose of this article to describe briefly the history of introduction and spread of two familiar trees in Hawaii, one now of vast economic importance and the other much prized for its ornamental value.

The Algaroba, *Prosopis juliflora,* D. C.

It may safely be said that no introduced tree has been of greater benefit to the islands than the algaroba, one of the mesquites, or kiawe, as it is locally called. It is also known as the honey locust, honey pod, cashaw, and July flower, and our name for the tree of algaroba comes from "Al-kharrubah," the Spanish name of the carob tree, or St. John's bread, the pods of which it resembles in flavor. The native home of the algaroba is from California to Texas and through parts of Mexico, Central and South America, as far south as Buenos Ayres.

While the history of its introduction to Hawaii is not definite, the conclusion seems to be that the first tree planted in the islands was raised from seed brought by Father Bachelot when he started out from Bordeaux in the early part of 1827 on his first trip to the Islands, and that the seed came from the Jardin du Roi de Paris and not from Mexico or Chile. This original tree was planted by Father Bachelot in December, 1828, in the north corner of the Catholic Church yard in Honolulu. Certainly, no man could have left a greater or more abiding monument, for the algaroba now covers vast areas on the different islands of mostly stony, arid, and precipitous land, which formerly was utterly worthless for other purposes.

The original tree is still growing on Fort street near Beretania street, and although it was severely topped in 1906, to make room for the Fred Harrison block, it has today a diameter at breast height of 3 feet 3 inches, and is still good for a great many years. The accompanying illustration shows the tree when it was in its full splendor about twelve years ago.



The Original Algaroba Tree in Hawaii.

The value of the algaroba in Hawaii has been enhanced by the ease with which it can be propagated and its ability to grow in arid regions. The tree belongs to the leguminous family, and begins to bear pods when six years old and even younger. These are eaten by stock, but the small, horny seeds are not crushed while passing through the alimentary system but rather are prepared for quick germination by the action of the digestive fluids. The spread of the tree in these islands has, therefore, been due solely to stock and by this means the algaroba has become a wild forest tree. It is estimated that it would have cost at least one

million dollars to plant by human agency the 80,000 odd acres in these islands which have been covered with more or less density by algaroba forests. And this wonderful and comparatively rapid spread of the tree has been accomplished without the expenditure of one cent for planting.

The algaroba, moreover, has been spread mainly on the barren lowlands, although it has gradually been working up the valleys and slopes until it is now found well established at elevations 1800 feet above the sea. Although the tree will grow "with its toes in the sea," its foliage is somewhat sensitive to the salt air when blow in by the strong trades. The tree has a long tap root which is sent down to great depths in search of water and which enables it to become independent of the surface water supply. We find the tree, therefore, mostly on the dry leeward sides of the islands on the lowlands which, fortunately, makes the algaroba forests most accessible for the gathering of their products. The tree, also, has the ability to sprout freely from the stump, making possible successive crops of wood without replanting.

The algaroba in Hawaii seems to excel in growth the tree in its original habitat. In Arizona, trees 75 years old are from 10 to 12 inches in diameter, and near Tucson trees measure 3 feet in diameter at the ground and 50 feet in height. On the Punahou grounds a tree not yet 70 years old measures 41 inches in diameter at breast height and 85 feet in height, while trees on the Dillingham place, which are 50 years old, average over 2 feet in diameter. The tree in these islands is a comparatively rapid grower, and takes hold of waste land in a surprising manner. It has few natural enemies; the caterpillars of two introduced and very common moths affect the bloom and occasionally reduce the size of the bean crop, and the grubs of four beetles bore into the sapwood of dead or felled trees.

The uses of the tree, in addition to being a forest cover for waste land, are too well known to need much elaboration here. The following, however, are some of the main products of the algaroba and the chief uses to which it is put in Hawaii:

Wood for fuel, charcoal, timbers, and posts.

Pods for fodder in their natural state and crushed into meal.

Blossoms for bee pasturage.

Trees for reclamation of waste land, ornament, and shade.

Young trees for hedges.

The wood of the algaroba is a dark reddish brown in the heart, is as heavy as and harder than ash, elm, or white oak, but not so strong or elastic. For fuel it is equal, cord to cord, to hickory or white oak. Its durability is highly in its favor, and the heartwood used as fence and foundation posts will last in the ground for a great many years. The sap wood is a clear yellow and is apt to be riddled by borers if not used soon after cutting. The

smaller wood makes excellent charcoal, while in Honolulu the best quality of fuel wood sells for $14 per cord in enormous quantities annually.

The high feeding content of the beans makes them a very valuable fodder. Stock are allowed to gather the fallen pods in the dry season when the pastures are barren, and they are also picked up and stored and fed to stock when the trees are not in bearing. Good results have been secured from grinding the pods into a meal which retains its original odor and flavor, without change, for six or eight months and is no more subject to the attacks of insects than is any other grain feed. The protein content of the pod compares favorably with oats, barley, wheat, corn, and other grain foods. The carbohydrate content is largely in the form of sugar rather than starch, and is, therefore, attractive to animals, more easily digested, and far more palatable. As a whole, the algaroba bean meal makes a well balanced ration without modification.

The honey industry in Hawaii is dependent almost entirely on algaroba blossoms, and the clear honey product is most delicious. The exports of honey and beeswax from the islands in 1915 were worth $49,169. The value of waste land has increased manifold on account of the algaroba, and what would Honolulu be without the algaroba as a shade tree? The young plants, set thickly together, have been successfully grown as hedges which are quite protective on account of their thorns.

A boon to stockmen, the standby of the apiarist, and the chief support of the wood dealer, the algaroba has well earned its place as the most valuable tree in Hawaii today.

The Royal Palm, *Oreodoxa regia*, H. B. K.

The lofty and noble stature of the royal palm won for this tree the scientific name which means "royal mountain glory." Always rigidly erect, with a stately head of comparatively few pinnate fronds, sweet-scented minute flowers which burst out in huge clusters at the green base of the leaf stalks, and a light-colored, smooth, gracefully tapering column, this palm has become a distinctive feature of ornament in the yards of Honolulu and other settlements in the islands. Differing from the algaroba, which has ventured without discrimination into the wild places and has become useful in many varied ways, the royal palm has timidly remained close to civilization and so far has been of value in Hawaii only as an ornament.

The royal palm is found naturally in Southern Florida, Cuba, Porto Rico, the West Indies, and Central America. In Porto Rico, where the tree grows wild, it is one of the most conspicuous objects in the landscape as it towers up on the hillsides with its stately white trunk. There the green sheathing base of the leaf is used for roofing and siding of huts and for a great variety of



The Original Royal Palm in Hawaii.

other purposes, especially by the poorer classes of the island. The outer portion of the trunk is used for boards, posts, poles and piles, and the leaves for thatching roofs. The economic uses of the royal palm are greater than those of any other tree in the West Indies.

The royal palm came to Hawaii 22 years later than the algaroba and the first tree, planted in Honolulu in 1850, is still growing thriftily and is the first palm on the right hand side of the front entrance to the yard of Mr. S. A. Baldwin at 1936 Nuuanu

avenue, at the corner of Bates street. This original tree, which shows its age by the strictures on the upper part of its trunk, has a height of 63 feet and is 21 inches in diameter at breast height. The seed of this original palm was brought to these islands from the West Indies by Dr. G. P. Judd in 1850 when he was returning, with the Princes Alexander Liholiho and Lot Kamehameha, from his mission to Europe in the interests of securing a treaty of independence for the Hawaiian Kingdom.

The family legend is that when, after Dr. Judd's arrival in Honolulu from this mission on September 9, 1850, his wife was looking over his clothes and shaking out some small round seeds, she asked her husband what they were. His reply was that they were seeds of a beautiful palm which he had had a black boy climb a tree and pick for him while his ship stopped at some port in the West Indies (presumably Kingston, Jamaica). Mrs. Judd then took the seed and planted it in the place where the parent tree now stands, which was then the grounds of Dr. Judd's sister, Mrs. Asher B. Bates. The property subsequently fell into the hands of Mr. Charles Gray, and from him passed to Captain Hobron, then to his son, Mr. T. W. Hobron, before the present owner obtained possession.

To clear up any doubt as to the identity of the original tree, the following statement from Mr. T. W. Hobron, dated San Francisco, January 13, 1916, has been secured:

"I have your letter in regard to the Royal Palm. Up to the time I left there nine years ago, no palm tree was cut down and the one shown in the picture sent (reproduced herewith) is the grand old original palm. We planted another on the makai side of the walk which shows in the picture. Before I left Honolulu some of our trees were nearly as tall as the original palm and the latter looked to me about to decline. It shows in the picture where the trunk was becoming smaller, but it seems to have taken a new lease of life. You can be certain that this is the grandfather palm of the Islands."

Division of Forestry

Honolulu, Hawaii, Sept. 8, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of August, 1916:

Round Top Forest Reserve.

On August 10, the public hearing was held at the Board offices to consider the setting apart of Round Top, near Honolulu, as a forest reserve. The attendance at this hearing was rather meager and, no objection being raised, the Governor on the same day signed the proclamation setting apart the 115 acres of government land as the Round Top Forest Reserve.

Proposed New Forest Reserves.

One day was spent in a combination trip to the western end of the Waianae Mountains with Entomologist D. T. Fullaway. In the morning Mr. Fullaway liberated several tubes of parasites on the melon fly in cucumber and vegetable fields on the lowlands in the region of Mokuleia and Kawaihapai. The rest of the day was spent on the mauka lands of Kealia in an examination of the western end of the proposed new Mokuleia Forest Reserve to determine upon the proper forest boundaries.

Three days were spent at Waiahole and Waianu I on Oahu with two government surveyors in making an examination and survey of boundaries of a proposed new forest reserve in this region. On the return trip I acquainted myself with the established boundaries of the proposed Hauula Forest Reserve.

These three projects will be submitted to the Board as soon as the final survey descriptions are ready.

Survey at Nuuanu Pali.

A detailed survey of the land at the head of Nuuanu Valley, Oahu, was made by government surveyors during the month, in order to determine the exact location of the boundary of the Honolulu Watershed Forest Reserve at the Pali. This was found necessary in order to determine whether the land desired by the Lord-Young Engineering Company for use as a cableway landing was within the reserve. The area was in-

spected by me while the surveyors were on the ground and the boundaries of the land applied for were familiarized.

Forest Reserve Matters.

A short stretch of fence was constructed on the boundary of the Honolulu Watershed Forest Reserve in Makiki in order to mark the line adequately and prevent trespass by stock. Other short stretches in Palolo and Manoa will receive similar attention.

The Manoa Ranger Station house was completed during the month and experimental tree planting on the station will soon be begun.

Ranger Lovell, during the month, has continued planting timber tree seedlings on government lands within the Kealia Forest Reserve, Kauai, and reports that all of the trees planted to date have survived.

Australian Red Cedar.

Through the kindness of Mr. A. W. van Valkenburg, several pounds of seed of the Australian red cedar, *Cedrela australis*, collected by Mr. E. C. Smith, have been turned over to the forest nurseryman for propagation. This tree, which is valuable for timber, has already been tried at Kunia, Oahu, where in a dry situation it is doing remarkably well. This introduction should be a distinct addition to the timber flora of the islands.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, August 31, 1916.

Superintendent of Forestry,
Honolulu, Hawaii.

Dear Sir:—I herewith submit a report on the work done during the month of August:

Nursery.

Distribution of Plants.

	In boxes transplanted	Pot grown	Total
Sold	100	156	256
Gratis	1150	860	2010
	1250	1016	2266

Collections.

Collections on account of plants sold amounted to	$ 4.20
Collections on account of seed sold amounted to	28.00
Rent of office building, Nursery grounds, for July	35.00
Total	$67.20

Collection and Distribution of Seed.

Owing to the large crop of koa seed, we have been able to collect in the neighborhood of Tantalus 35 pounds of clean seed. This is the largest supply we have ever had. We now have enough in stock to last us for several years. We are receiving a large number of requests from Australia and Africa for seed of the algaroba (*Prosopis juliflora*) and we are filling the orders as fast as we can get the seed ready.

Makiki Station.

The work at this station has been principally routine. We have in stock now a large number of plants of many species and they will all be in good shape for the coming planting season and Arbor Day.

Honolulu Watershed Planting.

The land recently planted in the neighborhood of Sugar Loaf Hill, Makiki Valley and Hering Valley has all been gone over and given a thorough hoeing and clearing. The section upon which the pest *Cacsalpinia bonduc* had taken possession has been practically cleared and all that remains to be done is to keep a strict lookout for seedlings coming up and destroy them. We will be able to commence planting again soon. We have a large number of koa and kukui trees about ready for planting.

Advice and Assistance.

The writer was called upon to assist in the pruning of trees along Kalakaua Avenue. Other requests have been attended to as follows: Calls made to places in and around the city, 13; advice given by telephone, 16; advice given at the nursery, 10; advice given by letter, 6; total, 45.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

Division of Entomology

Honolulu, Hawaii, September 5, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—Permit me to report on the operations of the Insectary for the month of August.

From the 1st to the 31st, there were produced 1891 females and 1007 males of Opius fletcheri, and about 2000 Tetrastichus. These were liberated as follows:

Opius Fletcheri.

	Females	Males
Oahu:		
Moiliili	100	43
Mokuleia	100	75
Sheridan Street	400	205
Maui:		
Haiku	75	30
Keanae	80	35
Hawaii:		
Paauilo	75	25
Hilo	50	25
Kona	200	110
Honokaa	50	20
Glenwood	50	25
Kauai:		
Kealia	75	30
Total	1255	623

Tetrastichus.

Oahu:	
Kalihi	200
Pawaa Junction	800
Maui:	
Lahaina	500
Keanae	200
Total	1700

The corn leaf hopper egg parasite, introduced by Mr. Osborn, has been very successfully multiplied during the month, and liberations are now being made on corn growing in the field. A full

report of this work will be made through the entomologist of the Sugar Planters' Experiment Station, who made the introduction.

Respectfully submitted,

D. T. Fullaway,
Entomologist.

Honolulu, Hawaii, September 5, 1916.

Mr. Otto H. Swezey,
Entomologist, H. S. P. A.,
Keeaumoku Street,
Honolulu.

Dear Sir:—Permit me to report on the work done at this institution in propagating the corn leaf hopper egg parasite, introduced by Mr. H. T. Osborn of your staff.

As you recall, Mr. Osborn arrived from Manila on the S. S. Persia Maru, July 31, with two cases, one containing grass seed, the other corn plants, with leaf hopper and parasites. The cases were brought to the quarantine room of this institution, were covered with black cloth, and holes bored in them which were stoppered with glass tubes during the day time, and at night with cotton stoppers. The material was very much mixed, including leaf hopper nymphs and adults, aphis, thrips, agromyzid, staphylinid, beetles, lace wing flies, and other small beetles, flies and psocids. All of the extraneous material seen was either destroyed at the window by crushing or put into alcohol. The corn leaf hopper egg mymarid began issuing at once, and there were obtained on the days following July 31 the following numbers:

August 1, 37; August 2, 29; August 3, 28; August 4, 18; August 5, 7; August 6, 2; August 7, 1; August 8, 1; August 10, 1; August 11, 10; August 12, 6; August 13, 1; August 14, 4; August 16, 2; August 17, 2; August 19, 1; total, 150.

There also appeared a few individuals of a dark colored *Cotetrastichus*, which Mr. Osborn had introduced into the cages on the way over. Of these 3 females were obtained from the cages, and Mr. Osborn handed me 1 female and 1 male, brought by him in tubes. After mating, these individuals were liberated in the cages established at this station. There was also one individual of a *Staphylinid* which emerged from Mr. Osborn's cages, and which I tried to breed, but it died without progeny.

Of the mymarids recovered, Mr. Osborn took 43 individuals to stock the cages at the Sugar Planters' Experiment Station, 101 were used to stock the cages here, and 6 were liberated on the 1st of August on some corn at the nursery of this institution in Makiki Valley.

The parasites are multiplying nicely in the cages here, and a report will be made monthly on the progress of the work of getting them established out of doors.

Very truly yours,

DAVID T. FULLAWAY,
Entomologist.

Division of Plant Inspection

Honolulu, Hawaii, Sept. 8, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of August, 1916, as follows:

During the month there arrived at the port of Honolulu, 42 vessels, of which 21 vessels carried vegetable matter. Of these vessels, three passed through the Panama Canal in transit to the Orient.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1566	26,366
Fumigated	8	20
Burned	48	56
Total inspected	1622	26,442

Of these shipments 26,191 packages arrived as freight, 174 packages as baggage of passengers and immigrants and 77 packages as mail matter.

Rice and Beans.

During the month 44,150 bags of rice and 2110 bags of beans arrived from Japan and Oriental ports and were found free from weevils and other grain pests and passed for entry.

Pests Intercepted.

Approximately 6074 pieces of foreign baggage were examined during the month, principally at the U. S. Immigration Station, and 31 lots of fruit and 16 lots of vegetables were seized and destroyed by burning. One package of tree seeds from Manila,

consigned to the Hawaii Experiment Station, was fumigated on account of weevil infestation. An ornamental plant in the baggage of a passenger from Japan was destroyed by burning. Eight banana suckers found in the baggage of a passenger from Samoa were seized and destroyed by burning, being prohibited from introduction under Rule VIII of this Board. This lot also contained six coconut plants, 1 ginger plant, 2 pandanus cones of ripe seeds and 8 tree seeds which were fumigated with hydrocyanic acid gas on account of infestation by scale insects. A package containing tree seeds and mango seeds from Manila by mail for the forester was fumigated before delivery.

One fern from California, infested with mealybug, was fumigated before delivery. Two cages with parasites for the cornleaf hopper and one cage with parasites for the anomala beetle arrived in care of Mr. Osborn of the H. S. P. A. The cages with cornleaf hopper were placed in the new quarantine room at the Board's office. After all the parasites had emerged the cages and their contents were first fumigated with carbon bisulphide and then were destroyed by burning. This was done to avoid the possible introduction of any fungus spores of the corn disease, as the corn and grass contained in the cages might have carried such spores on them. All soil and packing material on the other shipment has been burned.

Two boxes arrived by the Nippon Maru from Manila sent by Mr. Muir and were turned over to the H. S. P. A. The soil and packing of this shipment has also been destroyed.

Hilo Inspection.

Brother Matthias Newell of Hilo reports the arrival of nine steamers and two sailing vessels. Four steamers brought vegetable matter consisting of 185 lots and 2429 packages, all of which was found free from pests excepting one box of turnips which was destroyed on account of being infested with the turnip fly.

The Kiyo Maru arrived direct from Japan with 10,150 bags of rice, 311 bags of beans, 5 bags of barley, 5 packages of vegetable seeds and 2 bags sesame seeds. Ten bags of rice were infested with the rice moth (*Paralipsa modesta*) and were fumigated before delivery. Two sailing vessels brought lumber.

Inter-Island Inspection.

Sixty-six steamers plying between the port of Honolulu and other islands were attended to during the month. The following shipments were passed as free from pests:

Taro	629	bags
Plants	191	packages
Vegetables	114	packages
Fruit	21	packages
Total passed	955	packages

The following packages were refused shipment as they did not meet the regulations pertaining to soil and infestations:

Fruit	11	packages
Plants	20	packages
Total refused	31	packages

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

Division of Animal Industry

Honolulu, Hawaii, Sept. 20, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I have the honor to submit herewith the report of the Division of Animal Industry for the month of August, 1916:

Bovine Tuberculosis Control.

I beg to call attention to the appended report of the Assistant Territorial Veterinarian in regard to the last tuberculin test on the Kuliouou lands belonging to Mr. Charles Bellina. Sixteen cows reacted to the test and, as stated in this report, Mr. Bellina refused to remove them from the herd. Under these circumstances letters were addressed to the president of the Board of Health and to the City and County Physician of Honolulu, respectively, calling attention to the fact that the condition referred to appeared to be an infringement on both the Sanitary Code of the Board of Health and the Municipal Milk Ordinance. These two regulations require that all dairy cattle must be tuberculin tested, and classify as "adulterated" milk from tuberculous cows or from cows recently exposed to an infectious or transmissible disease.

Mr. Bellina delivers his milk to the Honolulu Dairymen's Association and the fact that this association has installed up to date pasteurizing machinery does not seem to me to warrant Mr. Bellina's disregard of the said ordinances, both of which aim at keeping the dairies free from infectious and contagious diseases, but say nothing about treating the milk for contamination.

In my opinion pasteurization, under efficient and official control, may be relied upon to destroy the tubercle bacteria in milk, but in view of the fact that this Board has endeavored for the past six years to eradicate bovine tuberculosis, and has succeeded in so far as 80 to 90 per cent. of the local dairy herds are concerned, it would seem this time were ill chosen for setting aside this policy and resorting to pasteurization. It would, in fact, be a great injustice to the many dairymen who have cleaned their herds of tuberculous animals at great expense, and who are constantly endeavoring to keep disease out of their herds, as experience has fully proved that tuberculous cattle on neighboring premises are very likely to transmit the disease to the clean herds surrounding them.

What action the territorial Board of Health and the municipal authorities will take in the matter remains to be seen and until decided upon it would, in my opinion, be well for this Board to defer further action.

Sore Head in Chickens.

The demand for sorehead vaccine has continued during the past month and fully 2500 doses have been either administered to sick birds or distributed for the use of poultry raisers on this as well as the other islands. The vaccine continues to give great satisfaction and will undoubtedly prove of value to the poultry industry when its effectiveness becomes more generally known throughout the Territory.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Hawaii, September 9, 1916.

Dr. Victor A. Norgaard,
Chief, Division of Animal Industry,
Board of Agriculture and Forestry,
Honolulu, T. H.

Sir:—I have the honor to submit the following report for the month of August, 1916:

Tuberculosis Control.

The following dairy cattle have been tested during the month:

	Tested	Passed	Condemned
Kamehameha Schools	29	29	0
Chas. H. Bellina	189	173	16
S. M. Damon	152	150	2
Victorino Vasconcellas	5	5	0
S. M. Damon	171	165	6
Chas. H. Bellina	2	2	0
Lunalilo Home	22	22	0

From the above list it will be seen that a total of 570 head were tested, out of which number 546 were passed and tagged, and 24 condemned and branded. Out of the number condemned, 6 have been slaughtered with the following post-mortem lesions:

No. 1. Shorthorn bull: had passed the test a number of times. Left retropharyngeal gland considerably enlarged and contained numerous small nodules of recent origin.

No. 2. Jersey bull, about 10 months old, purchased from the Waialae dairy a few months before; first time tested. Left

prescapular gland much enlarged, and contained numerous nodules of recent origin.

No. 3. Grade Jersey heifer, tested before. Both retropharyngeal glands affected.

No. 4. Grade Durham heifer; tested before. Two mesenteric glands affected.

No. 5. Grade Durham steer; first time tested. Two large tuberculous nodules at the site of castration.

No. 6. Grade cow; tested before. One mesenteric gland affected.

Post mortem examination of cow condemned at Kawaiahao Seminary July 22, gave the following lesions: Both retropharyngeal glands; all bronchial and mediastinal glands and numerous nodules in both lungs.

The sixteen cows condemned in the Kuliouou dairy still remain on the premises, in fact right in the dairy itself, the owner refusing to remove them, claiming that they are his own property and that he has a right to keep them anywhere he pleases. He is one of the largest producers connected with the Honolulu Dairymen's Association. At first he contemplated removing them to his Halawa property and with no attempt at segregation. There they would be a source of danger, spreading tuberculosis not alone to his own herd, numbering about three hundred head, but to Mr. S. M. Damon's herd as well, the two properties being adjacent. I was informed by the manager of the Damon ranch that it is practically impossible to keep the two herds separated because of the poor fencing. As a matter of fact, when the Damon herd was tested on August 21, two cows from the Halawa herd were found among them.

Sorehead.

The demand for vaccine for this disease among poultry is still increasing. During the past month 340 chickens and 20 turkeys were injected and 2300 cc. of vaccine produced in the laboratory. Good results continue to follow the use of this simple treatment, and the poultry raiser should at once apply for vaccine, upon the appearance of disease among his flock.

Importations of Livestock.

S. S. Wilhelmina, San Francisco—1 monkey, W. F. Ex. Co.; 45 cts. poultry.

S. S. Manoa, San Francisco—25 cts. poultry.

S. S. Tenyo Maru, Orient—1 dog, Fred Larsen; 1 ct. chickens, Y. K.; 8 cts. pheasants, E. H. Paris.

S. S. Matsonia, San Francisco—18 cts. poultry, 1 ct. rabbits, 1 ct. pigeons, W. F. Ex. Co.; 2 dogs, F. F. Baldwin; 1 dog, E. Magoon; 1 cat, Miss E. LaMotte.

S. S. Niagara, Sydney—2 teddy bears, 2 wallabys, R. H. Trent.
S. S. Lurline, San Francisco—4 horses, Walter Macfarlane; 1 stallion, H. B. Giffard; 7 dog, E. Crane; 16 cts. poultry.
S. S. Wilhelmina, San Francisco—1 dog, Donald Sanborn; 2 cts. pigeons, W. F. Ex. Co.; 22 cts. poultry.

Respectfully submitted,

Leonard N. Case,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, September 8, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—The following report of operations of the Division of Hydrography during August, 1916, is submitted:

Weather Conditions.

The rainfall at the lower levels has been generally light throughout the month. Although abundant showers occurred in the mountains, there were no especially heavy rains..

Streams and ditches were maintained at about normal stage.

G. K. Larrison and C. T. Bailey spent August 26-27 at Hilo, Hawaii, obtaining data for use by the Attorney General.

Operation and Maintenance Work.

Kauai—Thirty-two stream and ditch gaging stations and five rainfall stations were visited, and 29 discharge measurements were made. Four discharge measurements were made to determine seepage loss in Old Anahola ditch.

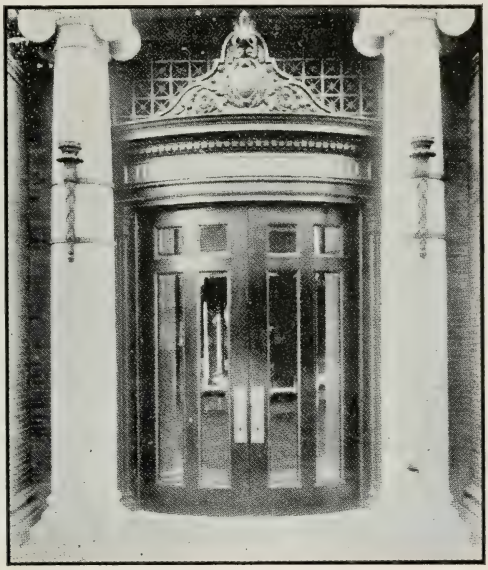
A considerable portion of the month was spent repairing and improving gaging stations. The measuring sections at Koaie, Waiahulu, Waialae, North Fork of Wailua and East Branch of North Fork of Wailua were improved and the water-stage recorder shelters at the two last named stations were enlarged and fitted for sleeping quarters for the hydrographer who sometimes has to spend the night there. The wells and intake pipes at five stations were cleared out by means of a small diaphragm pump recently purchased for the purpose.

Oahu—Thirteen stream and ditch gaging stations and five rainfall stations were visited during the month, and six discharge measurements were made.

Maui—Twenty-six stream and ditch gaging stations and one rainfall station were visited during the month, and sixteen discharge measurements were made.

Very respectfully,

C. T. Bailey,
Acting Superintendent of Hydrography.



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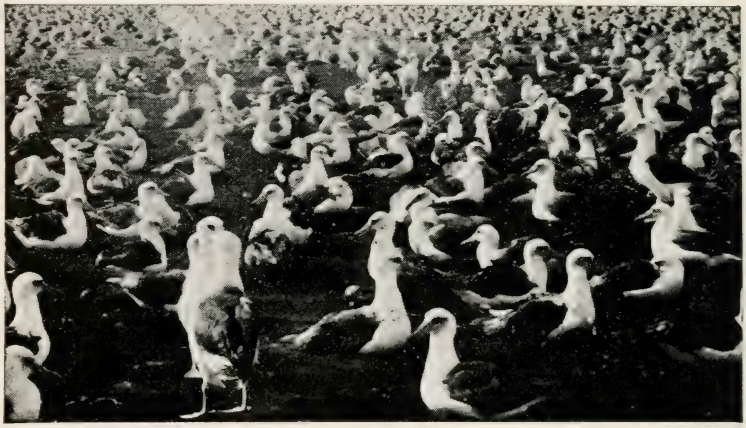
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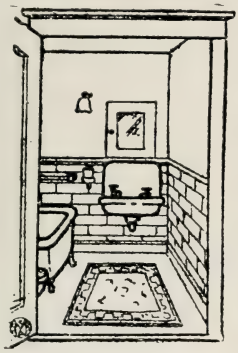
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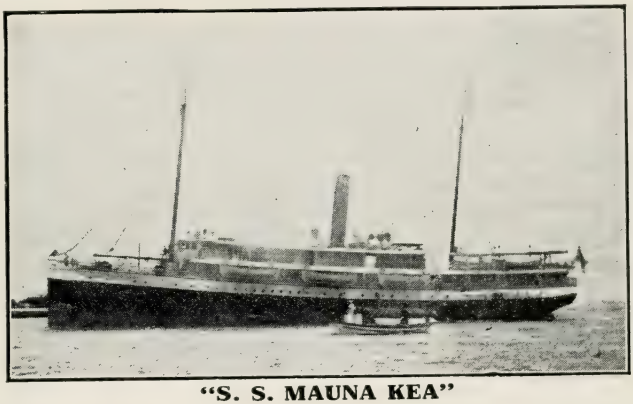
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DIVISION OF HYDROGRAPHY.

G. K. Larrison, *Superintendent of Hydrography.*

R. C. Rice, *Office Engineer.*

H. A. R. Austin, *Junior Engineer.*

C. T. Bailey, *Assistant Engineer.*

R. D. Klise, *Assistant Engineer.*

W. V. Hardy, *Assistant Engineer.*

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Mrs. E. U. Kuhns, *Librarian and Stenographer.*

Daniel Logan, *Editor of the Forester.*

THE HAWAIIAN FORESTER AND AGRICULTURIST

OCTOBER, 1916

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Board of Agriculture and Forestry

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FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, OCTOBER, 1916. NO. 10

The time for tree planting, just previous to the rainy season, approaches, and with it comes Arbor Day, which Governor Pinkham has proclaimed shall come this year on November 17. The origin of Arbor Day and its significance in Hawaii are pointed out in the Superintendent of Forestry's article on the subject in this issue and it is hoped that all tree lovers will celebrate the day by either planting a tree or caring for trees already planted. "If a person does no other good in life than plant a single tree, he confers a blessing on mankind."

The work of protecting our remaining native forests from damage by stock by the construction of suitable fences continues to progress and means a continued and greater supply of water, the Hawaiian forests' chief product and the life blood of agricultural Hawaii.

The second annual Hawaii County Fair held in Hilo on September 22 and 23 was a success in every way. The commodious Kuhio wharf lent itself to the occasion and afforded plenty of space for the exhibits and for the large crowds of people who came to see them. The Board's exhibit showing the activity of the four divisions attracted a good deal of attention and was visited by thousands of interested people. Probably the most notable feature of the fair was the splendid exhibit of pure-bred pedigreed Hereford bulls bred and raised on the Parker Ranch. These showed what can be accomplished in the livestock line in these Islands by the right beginning and good management.

The prompt discovery and extermination by Plant Inspector Ehrhorn of a colony of Argentine ants which came from the Coast with a shipment of plants on September 13, kept out from Hawaii a bad pest which is becoming very bothersome in California and the Southern States.

The multiplication and distribution of parasites on the melon fly and the corn leaf-hopper by Entomologist Fullaway are progressing without interruption, as shown by his report for September.

FEB 9 - 1917

Division of Forestry

Honolulu, Hawaii, October 16, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of September, 1916:

FOREST FENCING.

The work of fencing the boundaries of government land in forest reserves has been actively continued during the month. The fence around the four parts of Section A of the Olaa Forest Park Reserve along the Volcano Road, Hawaii, having a total length of 5.62 miles, which is being constructed under contract by I. Erickson, is nearing completion and should be finished now within two weeks. This fence was inspected by me in company with the contractor and Ranger F. B. Dodge, on September 19, and quite a number of posts which were not set firm or deep enough in the ground were rejected and the contractor required to reset them in accordance with the specifications.

Arrangements were also made on this same trip to fence approximately 1.05 miles of the boundary of the Upper Olaa Forest Reserve, Hawaii, in coöperation with the adjacent owner, in order to keep dairy cows from wandering into the government forest.

On Oahu, a stretch of fence, .41 mile in length, required for the same purpose, was completed during the month in Waiomao Valley, Palolo, along a part of the boundary of the Honolulu Watershed Forest Reserve, and a gang of four men is at present engaged in fencing three stretches of fence, amounting to approximately one mile, in Manoa Valley, along parts of the boundary of the Honolulu Watershed Forest Reserve and the Manoa Ranger Station where the native forest is in need of protection.

The fencing of 1.35 miles of the boundary of the Nanakuli Forest Reserve, Oahu, required by conditions in General Lease No. 788, is about to begin, since it has been ascertained that the U. S. Army does not contemplate using Nanakuli Valley for artillery range purposes. Pressure has also been brought to bear by the Land Commissioner on the holder of General Lease No. 730 in order to bring about the fencing of the boundary of the adjacent Makua-Keaau Forest Reserve, Oahu, which conditions in this lease require.

Plans are being formulated also for fencing additional sections of forest reserve boundaries in order to expend the present

available appropriation where barriers to stock are most needed for protection of the native forest.

TRIP TO HAWAII.

From September 17 to 25 I was on Hawaii looking into forest matters on that island. The hog-proof fences around Section B of the Olaa Forest Park Reserve, built in December, 1915, was found to be in good shape. With Forest Ranger F. B. Dodge, I examined the area in a corner of the Upper Olaa Forest Reserve where he is building his ranger cabin. This will prove to be a much better location for the station than the first site near Glenwood because it is situated nearer to the bulk of the forest reserves in this region and the rainfall at the new place is not so heavy. One day was spent in inspecting the fence nearing completion at 24 Miles, as stated above, and in arranging for the construction of additional necessary fences.

The remainder of my visit on Hawaii was spent in getting into shape the Board's exhibit at the Hilo County Fair, which was held on September 22 and 23, and in packing up the exhibit for return to Honolulu. The exhibit attracted much attention and received favorable comment from all who saw it.

RETURN OF J. F. ROCK.

Our Consulting Botanist, J. F. Rock, returned on September 6 from Java and the Philippines, bringing seeds and young seedlings of a great many timber and ornamental trees new to this country. The timber trees from the Philippines it is planned to set out at a high elevation on Tantalus, where they can be observed from time to time for their suitability to these Islands.

ARBOR DAY.

In preparation for tree planting on Arbor Day, which will be celebrated again at about the middle of November, the Forest Nurseryman is getting together a supply of ornamental and timber trees for distribution just previous to the day. It is hoped that the coming Arbor Day will be as successful as the last, when 21,248 trees were distributed from the government nurseries for planting in celebration of the day.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, October 10, 1916.

Superintendent of Forestry, Honolulu.

DEAR SIR:—I herewith submit a report of the work done during the month of September, 1916.

Nursery.—Distribution of Trees.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	390	136	526
Gratis	150	2087	2237
	540	2223	2763

Collections.

Government Realizations.

Collection on account of plants sold amounted to.....$7.90

Total$7.90

Preservation Forest Reserves.

Rent of premises at Half-Way House, Tantalus, for July, August and September.....$30.00
For use of 2 acres of land and gathering ti leaf, Kalawahine, Pauoa Valley, July, August and September.... 12.50
Rent of small piece of land, Pauoa Valley, 3 months.... .75
Permit of August 12, 1916, to occupy and use 69 acres of land in Hilo Forest Reserve near Keanakolu, yearly rental $34.50, from August 12, 1916, to August 12, 1917 34.50

Total$77.75

Collection and Distribution of Seed.

We have received a large quantity of fresh seed of the Australian red cedar (*Cedrela australis*) from Mr. A. W. van Valkenberg. This seed has been tested and found to be good. We are also in receipt of 6 packets of seed from Mr. J. F. Rock of the College of Hawaii, 2 packets from Municipal Botanic Gardens, Durban; 1 package from Botanic Gardens, Buenos Ayres; 3 packets from Royal Botanic Gardens, Calcutta. We are still receiving orders from Australia and Africa for algaroba seed, and

with the aid of outside help we are filling the orders as fast as we can get the seed ready.

Plantation Companies and Other Corporations.

Under this heading we have distributed 56,000 trees during the month. A number of large orders are still on file and those will be delivered during the next two months.

Makiki Station.

The work at this station consisted of mixing and sterilizing soil, transplanting and potting trees and also attending to a large stock of plants which we are getting ready for the planting season and Arbor Day.

Honolulu Watershed Planting.

The work done on the watershed has been principally hoeing and clearing away grass and weeds from the trees, also pulling out seedlings and root shoots of the pest *Caesalpinia bonduc*. The latter I think is not liable to give us much more trouble in that section. With the exception of a few seedlings that may spring up from time to time the tract is entirely clear of the pest.

Advice and Assistance.

At the request of people residing in and around the city, the writer has given advice and assistance as follows: Calls made, 10; advice given by telephone, 12; advice given by letter, 6; people calling at Nursery for advice, 8. Total, 36.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, Hawaii, October 16, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of September, 1916, as follows:

During the month there arrived at the port of Honolulu, 36 vessels, of which 20 carried vegetable matter. Of these vessels two passed through the Panama Canal in transit to the Orient.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1229	35,867
Fumigated	156	1,506
Burned	27	80
Returned	6	38
Total inspected.....	1418	37,491

Of these shipments, 37,243 packages arrived as freight, 143 packages as baggage of passengers and immigrants, and 105 packages as mail matter.

RICE AND BEAN SHIPMENTS.

During the month 17,849 bags of rice and 986 bags of beans arrived from Japan and Oriental ports and were found free from pests after a careful inspection.

PESTS INTERCEPTED.

Approximately 4195 pieces of baggage from foreign countries were examined during the month, most of which were found at the U. S. Immigration Station, and 16 lots of fruit and 10 lots of vegetables were seized and destroyed by burning. Four cases of plants were brought by Mr. Joseph Rock of the College of Hawaii from Java and the Philippines. Many of the plants were fumigated and then all soil was removed from each plant. This was replaced by sterilized soil. The plants were very clean except a few palms, which were infested with scale insects (*Aspidiotus cyanophylli*) and one Agave with *Saisettia nigra.* In the soil which was removed we found some *Chrysomelid* beetles, a few Anomala larvae, two species of ants (*Prenolepis bourbonica* and *Monomorium pharaonis*), a few millipeds (*Julus sp.*) and a centiped (*Scolopendra sp.*).

On September 13 a large shipment of plants, consisting of 7

cases of orchids, 1 case of bulbs and 32 cases of miscellaneous plants, arrived from the Coast. These plants were landed on Pier 10. We noticed some ants running about the cases, which I recognized as the Argentine ant (*Iridomyrmex humilis*), but to make sure I went to the laboratory on King street and, with Mr. Fullaway, determined them as such. I then had the whole shipment hauled to the only safe house we have, the fumigating house on Kilauea street, and gave the shipment a fumigation with hydrocyanic gas. We were unable to work in the house that afternoon on account of the strong gas which remained in the building. The next morning each plant was gone over carefully, all the soil removed and plants repacked in moss and paper. We passed a great many plants without finding a trace of ants. In the afternoon, however, we discovered the nests in a corner of a box of carnation plants and we wrapped this box and another, which also showed a few ants, into an oiled tarpaulin and fumigated these over night. In the morning the colony of ants was dead. It was indeed fortunate that we had the Kilauea street fumigation house, because if we had stored this shipment on any of the docks the ant colony might have migrated over night and lodged itself in some of the numerous cracks that are found on nearly all of the docks. This is the first instance in which I have discovered the Argentine ant arriving in the Territory. This ant is spreading very rapidly in California and is a terrible pest, not only in residences, but in stores and warehouses. It is a very hard ant to combat, and would prove a serious menace to many of our industries. The ant is liable to be brought into the Territory in a package, box or crate of merchandise at any time, as the records show that this is the manner in which the ant has been carried into various districts in several States of the Union. I must, therefore, take this opportunity to again appeal to the Commissioners to hurry with the proposed equipment of the Division of Plant Inspection. The present inadequate quarters on Pier 7 will not permit the handling of large shipments, but will do for small shipments. The floor of this office is a cement floor. The equipment of Pier 10 is practically given up, as that pier is soon to be torn down and is now crowded with building materials, so that it is impossible to handle plants in the vicinity of our laboratory. The equipment on Pier 16 has been useless ever since the removal of the Matson line from there. When all of the equipment is centralized under one roof, then only will we be able to work with safety.

Besides this ant we found a number of large garden snails (*Helix aspersa*), which is a troublesome pest in and around the San Francisco bay region. We also found the common garden slug (Limax species) in the packing of this shipment. Neither of these pests is in the Territory.

On September 19th we found a shipment of 70 boxes of pears badly infested with the codlin moth. All the boxes were hauled to the Kilauea fumigating house and there sorted. Fifty boxes

were condemned and were dumped into the red-hot coals at Iwilei garbage dumps.

On September 26, 84 bags of dried coconuts arrived from American Samoa for the Coconut Fibre Company. The nuts were clean, but as a precautionary measure they were subjected to carbon bisulphide fumes for 48 hours.

On September 13, 31 boxes of wormy apples were returned to San Francisco to the shipper as being unfit to land here. Six pineapple suckers arrived by mail from Queensland for the U. S. Experiment Station. They were fumigated and are now in quarantine under our supervision and orders.

The following packages were returned by the postmaster as being unmailable under ruling of the Federal Horticultural Board:

2 packages bulbs from Portugal;
1 package seeds from Manila;
2 packages seeds from Argentina;
1 package plants from Sydney, Australia.

On September 29, 1 case of rotten vegetables infested with maggots of flies was destroyed by burning. This came from the Orient.

Five cases of beneficial insects for the Hawaiian Sugar Planters' Association arrived during the month and were examined in my presence by Mr. Swezey. All soil and packing was destroyed by burning.

HILO INSPECTION.

Brother M. Newell of Hilo reports the arrival of seven steamers, of which four brought vegetable matter, consisting of 306 lots and 4410 parcels. All were found free from pests except one crate of turnips, which was dumped at sea.

INTER-ISLAND INSPECTION.

Fifty-nine steamers plying between the port of Honolulu and other islands were attended to during the month. The following shipments were passed as free from pests:

Taro	498	bags
Plants	153	packages
Vegetables	112	packages
Fruits	14	packages
Total passed	777	packages

The following packages were refused shipment, as they did not meet with the regulations pertaining to soil and infestations:

Plants	4 packages
Fruit	8 packages
Total refused	12 packages

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, Hawaii, October 18, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I beg to report that during the month of October there were produced in the Insectary 1936 females and 1572 males of *Opius fletcheri* (the new melon fly parasite), and that 2210 females and 1329 males were liberated in the open, the distributions being according to the following tabulation:

Opius fletcheri.

	Females.	Males.
Oahu—		
Sheridan Street	450	275
Kalihi	310	194
Moanalua	750	450
Palolo	125	75
Kaawa	100	40
Nuuanu	50	20
Castner	100	75
Hawaii—		
Kurtistown	50	50
Kailua	100	50
Kauai—		
Kapaa	100	50
Maui—		
Waiakoa	75	50
Total	2210	1329

We also produced and liberated 1000 *Tetrastichus*—400 at Kalihi, Honolulu, Oahu, and 600 at Wailuku, Maui—and 200 *Chalcids* (Dirhinus) at Moanalua, Oahu.

The propagation of the corn leaf-hopper egg parasite has gone on without interruption. Of the number secured in cages, 110 were used to restock the cages and 126 were liberated in field corn at Makiki Nursery. Ten were sent to Schofield to be liberated in the vegetable garden of Company H, First Infantry, where they are growing sweet corn for table use under irrigation throughout the year.

Respectfully submitted,

D. T. FULLAWAY,
Entomologist.

Division of Animal Industry

Honolulu, Hawaii, October 18, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I have the honor to submit herewith the report of the Division of Animal Industry for the month of September, 1916.

HOG CHOLERA.

Through inquiries and by visits to the principal hog-raising establishments on this island, during the past month, no trace of hog cholera or any disease resembling it has been met with or reported. Sanitary and hygienic measures in connection with close inspection of hogs imported from abroad should therefore suffice to guard against outbreaks of hog cholera, swine plague and similar diseases, while boiling of all swill and offal used as hog feed is conceded to be of benefit in preventing many of the diseases which generally accompany swill feeding. The use of anti-hog cholera serum at the time of weaning the pigs is continued by some and has been discarded by other breeders with no ill effect. There is, consequently, every reason to believe that whatever hog cholera infection may have been here has now died out.

GLANDERS ON HAWAII.

The Deputy Territorial Veterinarian for Northern Hawaii reports another outbreak of glanders with three affected animals and a considerable number exposed. I trust to be able to visit this district in the near future, possibly during the beginning of December, in order to make a thorough examination of conditions and ascertain to what extent this insidious disease has become established there.

SOREHEAD IN CHICKENS.

Sorehead in chickens still continues in various localities, though not to the same extent as during the summer months.

BOVINE TUBERCULOSIS.

Bovine tuberculosis work is reported on in the appended report by Dr. L. N. Case. The reacting cows mentioned in my report for last month as having been retained in a local dairy herd have now all been removed. (See appended letter from the Territorial Board of Health.)

DOG QUARANTINE.

An outbreak of distemper at the Quarantine Station resulted in the loss of one valuable dog, while the further spread of the disease was checked by the prompt application of distemper vaccine to all the young dogs on the premises. Without access to this preventive treatment, losses would undoubtedly have been much larger.

The wire fencing for the new kennels has not yet arrived, but plans and specifications are ready for pushing the work as soon as this material is received.

Respectfully submitted,

VICTOR A. NÖRGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Hawaii, October 16, 1916.

Dr. V. A. Nörgaard, Chief of Division of Animal Industry, Bureau of Agriculture and Forestry, Honolulu, T. H.

SIR:—I beg to submit the following report for the month of September, 1916:

TUBERCULOSIS CONTROL.

During the past month the following dairy cattle have been tested:

	T.	P.	C.
Dr. J. M. Whitney	13	13	0
Waialae Ranch	408	392	16
Tatula L. Miner	11	11	0

From the above tabulated list it will be seen that a total of 432 dairy cattle were tested, out of which number 416 were passed and 16 condemned and branded. All of these condemned cattle have been slaughtered and lesions of tuberculosis found in every one.

Besides the above, 12 head were tested for Mrs. C. M. Cooke and 2 head for S. J. Allencastre, the results of which will appear in the October report.

CHICKEN POX.

During the past month 1100 cc. of vaccine was prepared, most of which was sent to the other islands. Sixty chickens were injected and have made complete recovery.

HILO COUNTY FAIR AND CIVIC CONVENTION.

On September 22 and 23, at Hilo, was held the greatest County Fair ever seen in these Islands. From the occasional dog and poultry show has evolved the idea of a county fair in which shall be represented all the various industries of these Islands. The people of this Territory have now fully awakened to the immense advantages of such a fair as a means of advertising and displaying in concrete form the results of individual effort in all branches of industry. The friendly rivalry and competition for prizes will, perhaps, more than anything else, stimulate increased activity in all branches of agricultural and mechanical art.

The tireless work of the executive committee and the various subcommittees, backed by the support of the various civic organizations, assured the financial and educational success of the fair from the start. While practically all the exhibits were features in themselves, the one which created most interest and was a source of considerable astonishment to many was the fine exhibit of Hawaiian-bred livestock. This exhibit included several pure-bred pedigreed Hereford bulls bred and raised on the Parker Ranch, Hawaii. Some of the best blood to be found in the United States was represented here, and as far as individual merit is concerned, they would be hard to beat in any competition on the mainland. One of these same bulls, which was recently purchased by Mr. Harold Rice for the improvement of the stock on his Maui ranch, is as fine an animal as was ever seen in this Territory. The Hawaiian-bred mules, saddle and draft horses are individually superior to anything so far imported from the mainland. Considering that the livestock industry is only in its infancy, concerted effort in this line commencing only ten or twelve years ago, the results so far obtained are simply marvelous.

Another exhibit of considerable interest and economic importance was the display of various kinds of forage raised on the different homesteads, particularly those of Haiku, Maui. In this exhibit various varieties of legumes were represented, the beans being made into coarsely and finely-ground meals and the roughage into baled hay, with a palatability and nutritive value equal to if not greater than alfalfa. Already experiments have shown that all horse stock prefer these hays to those imported from California, which they only eat when there is nothing else. This new industry would seem to open another avenue of profit to the homesteader.

In passing, it may be said that the county fair has come to stay. It occupies a unique position in the advancement of all industrial lines, especially those agricultural, and the idea of having a Territorial fair at regular intervals in Honolulu, as a central point in this Territory, as suggested some years ago, and so strongly advocated at the last Civic Convention, is a move in

the right direction and should receive the unqualified support of the people in these Islands.

LIVESTOCK IMPORTATIONS.

S. S. Manoa, San Francisco—14 crates poultry.

S. S. Sonoma, Sydney—1 dog, 1 chicken, 3 pigeons, T. Hugard.

S. S. Niagara, Vancouver—1 elephant, 2 kangaroos, Ben Hollinger.

S. S. Matsonia, San Francisco—21 crates poultry.

S. S. Makura, Sydney—1 teddy bear, R. H. Trent; 1 bulldog, A. H. Nutting.

S. S. Lurline, San Francisco—1 collie pup, 25 crates poultry, R. T. Guard.

S. S. Hyades, San Francisco—24 mules, Schuman Carriage Co.; 42 crates poultry; 8 hogs, 4 milch cows, Lee Todd; 5 Holstein cows, J. P. Mendonca.

S. S. Wilhelmina, San Francisco—1 dog, H. B. Giffard; 38 crates poultry.

Respectfully submitted,

L. N. Case,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, October 9, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—The following report of operations of the Division of Hydrography during September, 1916, is submitted:

WEATHER CONDITIONS.

The rainfall during the month was below normal over most of the islands, especially in the mountains, with the result that streams are at low stages and reservoirs are considerably depleted. Heavy showers occurred during the early and latter parts of the month, but these were more prevalent at low than at high levels.

KAUAI RESERVOIR INVESTIGATIONS.

During the period September 5 to 15, an investigation was made to determine the possibility of storing Waimea flood water at elevations exceeding 3000 feet above sea level.

Agriculture without irrigation in the Waimea district is negligible, and many thousands of acres of rich lands now lie idle for lack of water.

The Waimea River discharges at times heavy floods of more than six billion gallons per day. These floods cause much damage in the lower valleys and have been the chief cause of a river wall being constructed to protect the village of Waimea. The mean flow of the river at the point of diversion of the Kekaha ditch is less than 50 million gallons per day.

Should means be devised by which these flood waters could be stored and utilized, the two-fold result of greater agricultural output and reduced flood destruction would be obtained.

The investigation resulted in the location of three possible flood-storage sites on which, it is believed, could be constructed, at reasonable cost, reservoirs having a total capacity of five or six billion gallons of water.

The stream flow records of the Mohihi, Waiakoali, Kawaikoi, Kauaikinana and Kokee streams, which, with the Koaie and Waialae streams, supply the Waimea River with practically all of its flow, indicate that the flood flow of these first five streams is sufficient to justify the construction of these three reservoirs.

Much more stream flow data, topographic surveys, and test borings for dam sites are needed to determine the feasibility of this project, and it is recommended that sufficient funds to cover these investigations be included in the appropriation asked for

this Division from the next Legislature in order that all preliminary work may be completed by the time the present land lease terminates in December, 1920.

HILO FAIR EXHIBIT.

An exhibit was prepared and shown at the Hilo Fair during the period September 21 to 24. This consisted of:

1. A model sharp-crested weir and recording instrument which actually measured flowing water.
2. Illuminated transparencies showing the structures used in diverting, measuring and utilizing water; the effects of forestation and deforestation on stream flow, etc.
3. Standard instruments and rain gages used by the Division.
4. Sample forms showing the development of data from gage heights and measurements to published data.
5. Photographs of irrigation structures on the mainland.
6. Plans and photographs of Venturi meters and flumes.
7. Publications and maps.

It is estimated that the exhibit was visited by at least ten thousand persons.

MAINTENANCE AND OPERATION.

Kauai. Mr. Hardy spent ten days with the Superintendent investigating possible flood storage sites on the upper Waimea River catchment area.

A cable station was established on the Kawaikoi to replace the old suspension foot bridge, used for flood measurements, which was worn out.

All trails in the upper Waimea drainage area were cleared and improved.

Nineteen stream and ditch and 10 rainfall-measurement stations were visited and 21 stream measurements were made.

Oahu. Twenty-six stream and ditch and five rainfall-measurement stations were visited and ten stream measurements were made.

Maui. Twenty-six stream and ditch and one rainfall-measurement stations were visited and 21 stream measurements were made.

ADDITIONAL QUARTERS RENTED.

Room No. 5 of the Kapiolani Building was rented on September 25 at $10.00 per month for an additional workshop and store room.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

Arbor Day in Hawaii

By C. S. Judd, *Superintendent of Forestry.*

The custom of naming a special day for tree planting had its origin in Nebraska where the farmers on the wind-swept prairies sorely felt the need of windbreaks and woodlot products. Through the efforts of Gov. J. Sterling Morton, Arbor Day was inaugurated and was first celebrated in 1872 when a million trees were planted in Nebraska alone. On Arbor Day in 1874, over twelve million trees were planted in this same state.

Since then, the celebration of Arbor Day has become general in most of the states and is a day specially named by the Governor of the state for tree planting. It is a day set apart to stimulate and encourage the planting of trees wherever they are needed and to remind everyone of the importance of trees, on account of their great and varied usefulness.

On the mainland Arbor Day is usually celebrated in the spring just as early as the ground can be worked, after there is no further danger from frosts. Here in Hawaii it has been found that the best time for tree planting is just before the fall rainy season begins, and this year the Governor has proclaimed November 17 as Arbor Day.

Arbor Day is preëminently a school celebration for "What you would have appear in the nation's life, you must introduce into the public schools." Very much has been done in beautifying school grounds through observance of the day, and very much more will be accomplished as the educational features of the occasion develop broadly.

In Hawaii Arbor Day was first observed on November 3, 1905, when Governor Carter generously contributed half of a fund for a prize of $5 for each of the 154 public schools, to be given to the grade whose planting on Arbor Day secured the most successful results. On that day 3,554 trees were distributed from the Government Nursery in Honolulu for planting and the following table shows how the observance of Arbor Day has become more popular and has continued in favor:

Trees Distributed From Government Nurseries in Hawaii For Planting on Arbor Day.

1905	3,554
1906	2,580
1907	1,524
1908	15,703
1909	63,614
1910	30,482
1911	11,508

1912	13,645
1913	11,961
1914	17,575
1915	21,248
Total	193,394

There was a reason for instituting Arbor Day in Nebraska where there were no trees, but there is still greater reason for celebrating this day in these islands because we once had the trees, but now they have largely disappeared. This was especially so on the lower lands, for kamaainas tell me that in the memory of not very old people the native forest between Honolulu and Waialua came down nearly to the road, the two large mountains of Maui were met by trees on the plains, and the Lihue plains on Kauai were covered with an undisturbed forest.

But the native forest has been pushed back up on to the hills by cattle and fire and it now remains for us to protect what is left and to plant again the barren areas that are not needed for agricultural crops and pasture.

When we plant trees we do not plant only for ourselves but for posterity as well. How small is the effort of planting a tree in the ground, compared to the value which accrues from the beauty, protection, and usefulness of the tree in after years! Just plant the tree and give it reasonable care and protection, water it when the ground gets dry, do not let it be used as a hitching post for horses, do not cut or hack at the bark or branches, provide it with a supporting stick or a boxed enclosure if it needs support or protection when young, and then you will be rewarded by its rapid growth and perfect form.

Trees are planted for five general purposes:

1. For *production* forests, in order to obtain useful material such as wood and lumber.
2. For *protection* forests, to conserve the water and protect the land from the destructive forces of nature such as winds and soil erosion.
3. For *park* forests, to furnish a place for pleasure and healthful recreation and a refuge for game.
4. For *orchards,* to produce fruits.
5. For *shade* trees, for their protection from the sun, ornamental value, and landscape effects.

In planting trees on the school grounds the hole should be at least two feet square and two feet deep and the top soil should be put to one side and used around the roots of the tree when it is set in the ground. Great care should be taken to prevent the tender roots from being exposed to the air and as much soil as possible should remain intact around the roots when the tree is taken from its container. The small tree should be planted about one inch deeper than it was in the nursery and the surface of

the ground around the tree which should be firmed should be almost level when the planting is finished.

One general mistake made in planting trees in Hawaii is not to give them enough room. Forest trees should be planted about 8 x 8 feet apart so that the trees will be drawn up by the light and the branches pruned off naturally by the shade, but if you are planting a number of ornamental trees, be sure to space them not closer than 30 feet apart. The royal poinciana and monkey pod should be planted at least 40 feet apart.

These shade and ornamental trees will occupy much more space than you anticipate when the ground is bare and when given plenty of room, which means abundant light, your trees will assume symmetrical proportions.

This year the Government Nursery has ready for distribution a large supply of the most popular flowering, shade, and forest trees, and will give to each applicant, so long as the supply lasts, twenty-four trees free of charge. Those who live on the other islands should place their orders with the Forest Nurseryman, box 207, Honolulu, not later than November 6, and those who live on Oahu not later than November 11. Mr. Walter D. McBryde will distribute trees from the Sub-Nursery at Homestead, Kauai, and Bro. Matthias Newell will distribute trees from the Hilo, Hawaii, Sub-Nursery to people who live, respectively, within a reasonable distance of those two places. People are urged not to take more trees than they can plant well and give reasonably good care.

The trees available for distribution have been introduced from many parts of the old and new world and mostly from tropical or sub-tropical countries. The list is as follows:

Flowering Trees.

1. Golden shower, *Cassia fistula* from India.
2. Pink shower, *Cassia grandis* from South America.
3. Pink and white shower, *Cassia nodosa* from India and Malaya.
4. Royal poinciana, *Poinciana regia,* the splendid wide-spreading tree with abundant red blossoms which originally came from Madagascar. It is also called the flame tree, and is planted extensively throughout the tropics.
5. Yellow poinciana, *Peltophorum ferrugineum.* This tree, which came originally from Australia and the Philippines, is not a poinciana at all, but on account of its golden blossoms is called the yellow poinciana for want of a better common name. It has a very hard, heavy, and bright orange colored wood and, growing to large size here, is suited to forest as well as ornamental planting.
6. Jacaranda, *Jacaranda mimosaefolia,* a graceful tree intro-

duced from Brazil with fine, fern-like, pinnate leaves and a wealth of blue or violet blossoms.

7. African tulip tree, *Spathodea campanulata.* This is a native of tropical Africa and Madagascar, which grows tall and stately and has large bright orange-red erect flowers produced at the tips of branches which render it strikingly handsome and conspicuous at a distance. Attempts to raise this tree here from seed had hitherto failed, but recently two pods of seeds were secured from Madagascar and the several thousand young trees which were raised from them have enabled the Forest Nurseryman for the first time to offer this beautiful tree for planting on Arbor Day.

8. St. Thomas tree, *Bauhinia tomentosa.* This is a small tree from Ceylon, which has pale pinkish yellow blossoms spotted with crimson, which has given rise to the superstitious idea that they are sprinkled with the blood of St. Thomas, hence the name of St. Thomas Tree.

Shade Trees.

1. Pepper tree, *Schinus molle.* This is the familiar tree with drooping foliage like the weeping willow and clusters of small pinkish berries. It came originally from Peru, but is now extensively planted in Southern California.

2. Texas umbrella tree, *Melia azedarach* var. This closely resembles our pride of India with the sweet lilac-like blossoms and came originally from India and Persia. It is called the Texas umbrella because it grows up into the shape of an umbrella and it first came to notice near the battle field of San Jacinto, Texas, but with no record of its introduction.

3. Ear pod tree, *Enterolobium cyclocarpum.* Because of its size this large, spreading tree is not recommended as a road-side tree or for planting in small yards. It grows rapidly and covers a large area with its spreading branches. It has a smooth, light-colored bark and fine pinnate leaves but the queerest part of the tree is the seed pod which is circular in shape and resembles a huge ear, hence the name ear pod tree. It is a native of Venezuela.

Forest Trees.

1. Silk oak, *Grevillea robusta.* This is an introduction from Australia which although it has conspicuous golden yellow blossoms is not recommended for yard planting because the constantly falling leaves litter up the ground. It, however, is an excellent shade tree for coffee growing and its beautifully marked wood is suitable for furniture and interior finish.

2. Ironwood, *Casuarina equisetifolia.* This is found naturally in the old world tropics and is the common she oak of Australia. It is not a handsome tree, but it produces good firewood and its chief value in Hawaii is due to the fact that it will grow in exposed and barren places where no other tree will take hold.

3. Japan cedar, *Cryptomeria Japonica.* This is the sugi of Japan which produces useful timber and is also an ornamental tree. It grows best in protected places where the soil is rich.

4. Blue gum, *Eucalyptus globulus.* This, to us, is perhaps the most familiar Australian gum tree. It grows well in Hawaii and has leaves which produce a pleasant odor but the twisted grain of its wood makes it objectionable for use as fuel.

5. Lemon-scented gum, *Eucalyptus citriodora.* This is another Australian tree which is becoming a favorite in Hawaii because of its smooth, light-colored bark, erect habit of growth, and long pendulous leaves which have the pleasant odor of lemon verbena.

6. Swamp mahogany, *Eucalyptus robusta.* This is now the most popular Australian eucalyptus tree in Hawaii, for more than half of the trees planted out last year or about half a million consisted of swamp mahogany. It grows well in a great many different situations, produces excellent firewood and timber, and sprouts readily from the stump.

Australian Red Cedar

A NEW TREE INTRODUCTION

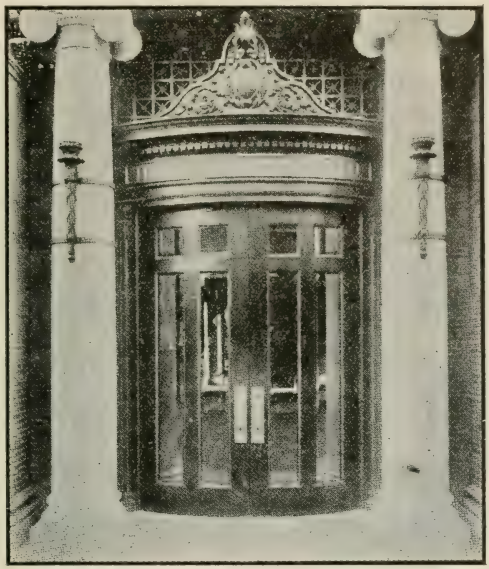
By C. S. Judd, *Superintendent of Forestry.*

The Division of Forestry will have ready for distribution within a few weeks several thousand young trees of the Australian red cedar, *Cedrela australia,* which it desires to have planted out in as many different situations as possible in order to test its adaptability to these islands. This is a timber tree which promises to be of great value to the Territory. Its distribution has been made possible by the gift of a quantity of seed which Mr. A. W. van Valkenburg and Mr. E. C. Smith kindly turned over to this Division and which Mr. Smith personally selected and gathered recently in Australia.

The timber of the Australian red cedar is considered the most valuable produced in New South Wales and it is in universal use there. The tree is found growing naturally in Queensland and New South Wales, especially in the warmest and moistest districts between the latitudes of 35° and 20° south. It grows best in protected places where there is a little shade. The tree is easily transplanted, is a rapid grower, and in Australia attains a height up to 200 feet with a diameter up to 10 feet. The size of the average tree now being cut in Australia is about half of the above.

The wood of the Australian red cedar is equal to mahogany but lighter in weight. It is used for many of the same purposes, for tables, cabinets, furniture, doors, and interior finish and it is excellent for carriage building because it is light and easily worked. It seasons well with very little splitting and is very durable when kept dry.

The Division of Forestry will be glad to place a number of these trees in the hands of tree planters who will be willing to set them out in suitable situations, care for them, and report on their growth in after years. Orders for these trees will be gladly received from those who are willing to do this and who have not already received special notification that these trees will be available for distribution.



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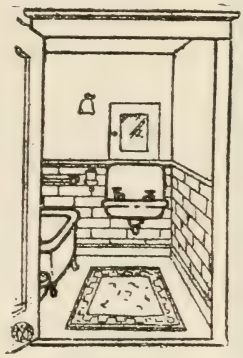
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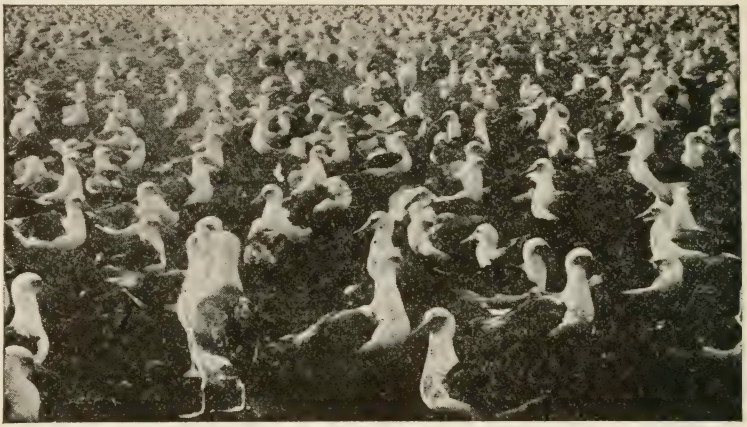
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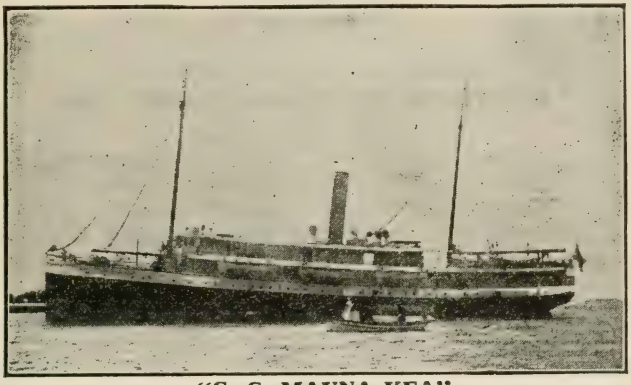
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THE HAWAIIAN FORESTER AND AGRICULTURIST

NOVEMBER, 1916

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FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, NOVEMBER, 1916. NO. 11

The investigation of the best kind of trees for planting for different purposes in the various parts of the Territory suggested at the last meeting of the Hawaiian Sugar Planters' Association, to be undertaken by the Division of Forestry with the coöperative assistance of the College of Hawaii, notice of which is contained in this issue, should result in the collection of a fund of definite information of great value to tree planters in the islands. As shown by the routine report of the Superintendent of Forestry, preliminary work on this investigation has already begun.

The work of the Division of Plant Inspection continues to be one of the most important branches of the Territorial service and almost every month injurious insects of some kind are detected in plant shipments and promptly destroyed to prevent their becoming established here. The discovery and destruction by Superintendent Ehrhorn this month of the pupa of the eastern tussock moth, a serious pest to forest and ornamental shade trees in the eastern United States, is an instance of this. It is hoped soon to be possible to provide a suitable building and fumigating rooms for this Division near the waterfront.

Entomologist Fullaway distributed 2630 parasites on the melon fly during November on three of the islands and also small lots of the more recently introduced parasite on the corn leaf hopper. These parasites, as far as possible, will be sent upon request to corn and melon raisers who are troubled with these pests.

The Territorial veterinarians are doing all within their power to overcome the septicemia disease which has again broken out in cattle and hogs on Oahu, as will be seen by the Territorial Veterinarian's report for November. Bovine tuberculosis tests during the month showed only one per cent of infected dairy cattle.

Division of Forestry

Honolulu, Hawaii, Nov. 21, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of October, 1916:

Forest Fencing.

Several forest reserve boundary fencing projects were completed during the month. The largest of these was the fence around Section A of the Olaa Forest Park Reserve in the region of 24 Miles on the Volcano Road, Hawaii. This was begun on April 15, 1916, under contract with Mr. I. Erickson of Hilo and completed on October 20. Previous to the final acceptance of the fence, the contractor was required to reset many of the posts which were not up to specifications. The total length of this fence is 29,140 feet or 5.52 miles and the four sections of fine ohia and tree fern forest enclosed by it will be secure from damage by wandering stock for some time.

Two stretches of the boundary of the Honolulu Watershed Forest Reserve in Waiakekua and Luaalaea Ravines in Upper Manoa Valley were run out with the aid of government surveyors and fenced during the month. The fence around the Manoa Ranger Station, which was also completed in October, brings the total length of fencing in this region up to 1.16 miles.

Eight quarter-acre plots on the Manoa Ranger Station were also laid out and staked preparatory to the experimental planting of timber trees under forest conditions.

Arbor Day.

Preparations for Arbor Day to be celebrated on November 17 by proclamation of Governor Pinkham, were made by the assembling of quantities of the 17 most popular and suitable flowering, shade and forest trees by the nursery force previous to distribution and shipment and by the publication in local newspapers and the "Forester" of an article on the subject by which it was aimed to call attention to Arbor Day and arouse interest in its celebration by tree planting.

Miscellaneous.

One day was spent in visiting the Pupukea Forest Reserve to ascertain the status of a planting agreement with Mr. C. G. Owen. This has been taken up in a special report.

As instructed by the Board, I also prepared a working plan for the tree study suggested by the H. S. P. A. Copies of this plan have been sent to the Commissioners for comment, but as yet only two have been heard from.

An opinion was received from the Attorney General to the effect that the license for the tunnel and conduit right-of-way from Hillebrand Glen to No. 4 Reservoir in Nuuanu Valley, to be issued by the Land Commissioner to the Oahu Loan Fund Commission, should receive the approval of this Board since the project is situated within a Forest Reserve. As soon as the license, which is now being prepared, is ready, it will be submitted for your approval.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, October 31, 1916.

C. S. Judd,
Superintendent of Forestry,
Honolulu.

Dear Sir:—I herewith submit a report of the work done during the month of October, 1916:

Nursery—Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold		50	35	85
Gratis	1500	500	606	2606
	1500	550	641	2691

Collections.

Collections on account of plants sold amounted to	$ 1.80
Rent of office building, nursery grounds, for August	35.00
Total	$36.80

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 10,000 in seed boxes and 1550 in transplant boxes. We still have on file orders for 100,000 plants which we expect to deliver during November and December.

Makiki Station.

The work at this station has been principally mixing and sterilizing soil, transplanting seedlings into boxes and pots and doing other routine work. We have a large quantity of trees now ready for the coming planting season. A number of new species are making a good growth and look very promising.

Honolulu Watershed Planting.

During the month the districts infested by the *Caesalpinia bonduc* was gone over and all the sprouts and seedlings that could be seen dug out and destroyed. The damp weather has caused many of the seeds of this plant to sprout up. We have had also an extra growth of grass and weeds among the young trees which had to be attended to. We expect to get back to making holes and planting soon. We have a large quantity of koa plants ready for the coming planting season.

Advice and Assistance.

During the month the writer has been requested to make calls and has given advice as follows:

Calls made	7
Advice by telephone	10
Advice given at nursery	12
Advice given by letter	5
Total	34

Respectfully submitted,

David Haughs,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, Hawaii, October 31, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of October, 1916, as follows:

During the month there arrived at the port of Honolulu 44 vessels, of which 20 carried vegetable matter and 1 vessel moulding sand. Of these vessels 6 passed by the way of the canal in transit to the Orient.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1457	39,223
Fumigated	11	408
Burned	21	31
Returned as contraband	2	2
Total inspected	1491	39,664

Of these shipments 39,223 packages arrived as freight, 164 packages as mail matter and 159 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 33,057 bags of rice were inspected and found free from pests. Out of 1747 bags of beans from Japan a lot of 389 bags were found infested with larvae of *Paralipsa modesta*, the rice moth, and were fumigated with carbon bisulphide before delivery. Approximately 6621 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and 21 packages of fruit and 13 packages of vegetables were seized and destroyed by burning. Two large orchids on original stumps from the forest in the Philippine Isles arrived in the transport "Logan" October 5th and were seized and destroyed by burning. Under the bark of the limb on which the orchid was growing I found larvae of a wood boring beetle. In the packing were found some centipeds and a cockroach (*Polyzostera soror*). Ten ornamental plants, mostly cuttings, were found in the baggage of a passenger from Fiji and were fumigated with hydrocyanic acid gas. One ginger plant was infested with mealy bugs.

One case of plants from New Jersey by express had to be fumigated with hydrocyanic acid gas on account of having the citrus mealybug on some of the plants. On going over each plant care-

fully after fumigation, I discovered a pupa of the Eastern Tussock moth (*Hemerocampa leucostigma*). This is a very serious pest to forest trees in the eastern United States, also to ornamental shade trees in many eastern cities. All soil was removed from the plants and burned. One package of plants from New York by mail was fumigated on account of mealybug (*Pseudococcus citri*). One lot of coffee seeds by mail from Java were treated with formalin as a precautionary measure. One package of palm seeds by mail from Manila were returned as contraband. One case of beneficial insects came by the "Siberia Maru" from the Orient for the Hawaiian Sugar Planters' Association. The usual supervision was given and all soil and packing destroyed by burning.

Hilo Inspection.

Brother M. Newell of Hilo reports the arrival of five steamers, four of which brought vegetable matter consisting of 195 lots and 3049 packages. The "Anyo Maru," from Japan direct, brought 2180 bags of rice, 459 bags of beans, 4 packages of vegetable seeds and 1 bag of sesame seed. All these shipments were free from pests or disease.

Inter Island Inspection.

Sixty-seven steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	572	bags
Plants	214	packages
Vegetables	89	packages
Fruit	8	packages
Total passed	883	packages

The following packages were refused shipment as they did not meet with the regulations pertaining to soil and infestations:

Plants	8	packages
Fruit	4	packages
Total refused	12	packages

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, Hawaii, November 21, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—We are still propagating and distributing the new melon fly parasite, and during the month 2215 females and 1747 males were propagated from 81,900 pupae of the melon fly handled. The distribution of the parasites was as follows:

Opius Fletcheri.

	Females	Males
Oahu—		
Kalihi	150	75
Sheridan Street	450	270
Moanalua	450	320
Kalakaua Avenue	250	175
Waiahole	100	60
Hawaii—		
Kau	75	40
Pepeekeo	40	25
Kauai—		
Homestead	100	50
Total	1615	1015

We are also multiplying some of the fruit fly parasites, and distributed these as follows:

Tetrastichus.

Oahu—	
Kalihi	800
Piikoi Street	1000

Chalcids.

Moanalua	200
Sheridan Street	200

D. Tryoni.

Manoa	100
Piikoi Street	212
Hawaii—	
Kau	75
Total	2587

The corn leaf hopper egg parasite is being propagated in field corn at the nursery in Makiki Valley, and from time to time small lots have been distributed: 2 to the U. S. Experiment Station, which is growing corn on the station grounds, back of Punchbowl and also at Castner; and 1 lot to the gardener in charge of the vegetable garden, Company H. First Infantry, at Castner.

In the office, the routine work of advising in regard to insect pests and caring for the collections has occupied most of the time.

Respectfully submitted,

D. T. Fullaway,
Entomologist.

Division of Animal Industry

Honolulu, Hawaii, October 31, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith the report of the Division of Animal Industry for the month of October, 1916:

Hemorrhagic Septicemi in Cattle and Hogs.

During the past month a number of outbreaks of this fatal disease have come to notice here, simultaneously with the appearance of many similar epidemics in nearly every part of the United States. The disease is characterized by more or less well defined hemorrhages under the serous and mucous membranes, serous exudations in various tissues and organs, local edema, infectious pleuro-pneumonia and hemorrhagic enteritis. The cause is a specific microorganism which normally may be found in the air passages and intestinal tract of healthy animals, but which at times becomes disease producing, the exact conditions and causes for which are not yet definitely established. But any condition which tends toward reducing the vitality is likely also to lessen the animal's power of resistance to disease. Malnutrition, exposure to inclement weather, prolonged physical exertion, such as met with when shipping livestock on land or water, moldy or decayed feed all tend to cause the appearance of the disease. Young stock is especially susceptible but no age or class is exempt. So many cattle of late have died in stock yards that the disease in certain sections is called "shipping fever."

The disease was first observed here about four years ago during a shipment of cattle from Hawaii. At the same time the first reports of its appearance as an epidemic was received from a half dozen of the States. Since that time we have seen little of it here while it has spread over practically the entire Mainland until, this year, several States have had to take special measures to guard against it.

In this Territory it would seem that the Kona side of Hawaii is most seriously infected, even though no outbreaks have been reported direct from there. But nearly every case which has come under observation here can be traced more or less directly to Kona. Unusual heavy shipments of cattle have arrived here from Kona and a number of them have had dead or dying cattle among them at the time of arrival. One shipment as high as five head. These deaths cannot be attributed to rough weather or hard handling, although shipping undoubtedly accelerated the development of the disease.

In regard to the outbreaks which have occurred among hogs, they have all been among animals fed on slaughter house offal and in practically every case Kona cattle have been among those furnishing the refuse. In hogs the disease takes practically the same form as in cattle—extensive hemorrhages, pleuro-pneumonia and intense bloody inflammation of the intestines. Characteristic are the gelatinous exudations under the skin and in both chest and abdominal cavities as well as the intense bluish black discoloration of all lymph glands. The disease in hogs corresponds closely to what we used to call swine plague and does undoubtedly appear most frequently and in its most fatal form where the hog cholera infection is present. Had that been the case here the flocks where the disease appeared would undoubtedly have been wiped out in short order.

Medical treatment is of little or no value. An effort to check one of the outbreaks by means of large injections of hog cholera serum gave doubtful results. About thirty head out of more than seventy died, even though but few were affected at the time of treatment. It is, of course, impossible to say how many would have died had this treatment not been resorted to. In a smaller flock, about thirty head, two of the worst ones were treated similarly. One of these died and one is still alive. Of the remainder, untreated, more than two-thirds are dead and some sick.

Under these conditions the further spread of the disease could but be viewed with alarm and having learned from the veterinary periodicals that a vaccine had been successfully used on cattle, and especially in an outbreak which threatened to wipe out the buffalo and elk in the Yellowstone National Park, the following inquiry was cabled to the Federal Bureau of Animal Industry in Washington, D. C.:

"Hemmorhagic septicemia prevalent. Principally hogs—also other animals. No hog cholera nor necro. Is either hog cholera serum or bovine hemorrhagic septicemia serum of curative value to hogs with typical pasteurellosis, or preventive to exposed. Situation serious. Advise measures.

"Norgaard."

The following day a reply was received as follows:

"Hemorrhagic septicemia vaccine frequently effective preventive. Available Cutter laboratories, Berkeley, California. Serum not available. Strict isolation and disinfectant.

"Melvin."

A cable was then sent to the Cutter laboratories in Berkeley for fifty boxes of the vaccine in question, which is expected here on November 21st. This vaccine is prepared for cattle, but may possibly prove effective for hogs also. In any case it constitutes the only therapeutic and preventive measure, beyond sanitary and hygienic precautions, which seems to hold out any promise of

success. The disease is, however, known to disappear as suddenly as it appears, but the very fact that the organism causing it is, so to speak, ubiquitous, makes all effort at eradication seem more or less futile. It is the only known infectious disease which may originate spontaneously—it does not have to be introduced—the infection is here and everywhere, but it becomes disease producing only under certain obscure circumstances on the disappearance of which the infectious agent again becomes innocuous.

Neither horses, dogs nor poultry is exempt from the disease, but fortunately human beings seem to be immune. It is, therefore, of importance that all poultry be kept away from the hog yards where the disease appears.

Importation of Livestock.

Permit has been obtained from Washington for the importation of 50 merino rams from New Zealand. They are for the Parker Ranch on Hawaii and will be shipped from Wellington to San Francisco and reshipped to Honolulu for quarantine. In previous years these shipments went via Sydney, the direct New Zealand steamers refusing to carry livestock, but as will be seen from the appended correspondence the new arrangement is expected to prove more satisfactory.

The Parker Ranch also expects five purebred Kentucky jacks by an early steamer, the official inspection certificates having already arrived.

Quarantine Station.

The wire fencing for the new kennels is expected here on the next "Hilonian" when the construction of the same will begin without delay.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Hawaii, November 6, 1916.

Mr. V. A. Nörgaard,
Chief of Division of Animal Industry,
Bureau of Agriculture and Forestry,
Honolulu, T. H.

Sir:—I have the honor to submit the following report for the month of October:

Tuberculosis Control.

The following dairy cattle have been tested during the past month:

	T.	P.	C.
Mrs. C. M. Cooke	12	11	1
S. J. Allancastre	2	2	0
T. F. Farm	102	98	4
Y. Tsuda	26	26	0
H. Focke	5	4	1
C. W. Lucas	23	23	0
Frank Walph	7	7	0
Richard Kapena	3	2	1
M. Kawomura	6	6	0
M. Quintal	10	9	1
S. Tsumoto	12	12	0
M. Robinson	7	7	0
C. J. Day	7	7	0
E. M. Taylor	2	0	2
Alex. Young	44	43	1
M. Riedell	5	5	0
J. P. Mendonca	15	15	0
D. Tello	5	4	1
W. P. Louis	12	11	1
S. Oshiro	17	17	0
Frank Correa	12	11	1
Frank Andrade	115	108	7
Wm. Meyers	32	30	2
R. McKeague	3	3	0
J. Cribb	10	9	1
E. C. Smith	4	3	1
F. Johnson	7	7	0
J. Schwenk	8	8	0
T. Morioko	10	9	1
S. Todo	17	17	0
Ben Mahi	8	8	0

From the above tabulated list it will be seen that a total of 548 cattle were tested, out of which number 522 were passed and tagged and 26 condemned and branded.

One post-mortem examination was made on a cow condemned in one of the local dairies and lesions of tuberculosis found in both body cavities.

Importations of Live Stock.

S. S. Manoa, San Francisco—27 cts. poultry.

S. S. Hilonian, San Francisco—10 Holstein cows, 1 bull, Maui Agriculture Co.; 4 horses, Haw. Com. Co.

S. S. Matsonia, San Francisco—4 cts. guinea pigs, U. S. Ex. Station; 32 cts. poultry.

S. S. Lurline, San Francisco—1 Berkshire boar, 2 Berkshire sows, F. G. Krauss; 25 cts. poultry.

S. S. Wilhelmina, San Francisco—1 dog, Mrs. Dr. Carey; 1 dog, Dr. W. T. Monsarrat; 30 cts. poultry.

S. S. Tenyo Maru, Orient—2 cts. Jap. games, N. Hashimoto.

S. S. Manoa, San Francisco—34 cts. poultry.

Respectfully submitted,

Leonard N. Case,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, November 10, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—The following report of operations of the Division of Hydrography during October, 1916, is submitted:

Weather Conditions.

The rainfall in the mountains was generally excessive over all the islands, while many of the lower valleys experienced dry weather. On Kauai the mountain rainfall was heavy, resulting in good discharges for all streams. On Oahu plentiful showers have resulted in all streams and ditches being well filled during the latter part of the month. Heavy showers on October 27 to 29 filled ditches to near capacity. The Hillebrand Glen measurement station showed an average discharge of 470,000 gallons per day for the month, a minimum of 60,000 gallons per day, and a maximum of 2,950,000 gallons per day. On October 27th, 28th and 29th the mean discharges were 1,020,000, 2,950,000, and 2,520,000 gallons, respectively.

Territorial Water Commission.

The superintendent spent a large portion of his time during the month on his duties required as chairman of the Territorial Water Commission.

1916 Report.

The 1916 report for the fiscal year ending June 30, 1916, was completed and will be mailed to the Washington office of the U. S. Geological Survey for printing by the next mail. This report will show all detailed data, including daily, monthly, and annual mean, maximum, and minimum discharges of all ditches, streams, etc., under observation in the Hawaiian Islands, as well as a large amount of mauka rainfall data which are not published by the U. S. Weather Bureau. Pending the printing of this report, blue print copies of data are available without cost to interested parties.

Annual Rainfall Records.

The following rainfall records for the year ending June 30, 1916, are interesting:

Kauai—	
Mt. Waialeale, elevation 5070 feet	561 inches
elevation 4020 feet	314 inches
Kilohana Lookout (overlooking the Waniha valley),	
Kokee (camp site in proposed Waimea Canyon part),	
elevation 3500 feet	77 inches
Kekaha, elevation 500 feet	18 inches

Waialeale is about 15 miles from Kekaha in a straight line.

Oahu—	
Wahiawa Water Co. Intake in Koolau Mt., elevation 1200 feet	256 inches
Nuuanu Pali, elevation 1200 feet	155 inches
Manoa Valley, elevation 300 feet	176 inches
Kalihi Valley, elevation 500 feet	164 inches
Punaluu Valley, elevation 300 feet	127 inches
Makaha Valley, elevation 700 feet	97 inches
Wahiawa Village, elevation 900 feet	77 inches
Maui—	
Puu Kikui, above Lahaina, elevation 4300 feet	363 inches
Mt. Eke	243 inches
Keanae	296 inches
Iao Tableland	239 inches

Operation and Maintenance.

Kauai.—Thirty stream and ditch measurement stations and 6 rainfall measurement stations were visited and 28 discharge measurements were made. About 12 miles of mountain trails were cleared of brush, logs, etc., and put in good condition.

Oahu.—Fourteen stream measurement stations and 4 rainfall measurement stations were visited and 1 discharge measurement was made. The greater part of the month and most of the personnel were occupied on office work, and Territorial Water Commission work. The construction of a new bridge for flood measurements on the North Kaukonahua Stream was begun.

Maui.—Thirty-two stream measurement stations and one rainfall measurement station were visited, and 24 discharge measurements were made. A new cable car for the Honokahau station was constructed.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

Progress in Forestry During 1916

The following letter of the Superintendent of Forestry to Hon. L. A. Thurston, chairman of the Committee on Forestry of the Hawaiian Sugar Planters' Association, which was written at Mr. Thurston's request, tells of progress made in forestry during the present year, and is here reproduced for the benefit of the readers of the Forester:

November 23, 1916.

Hon. L. A. Thurston,
Chairman of Committee on Forestry,
Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

Dear Sir:—In response to your request of October 3 for a statement of the development of forestry during the past year, I take pleasure in submitting the following:

The activities of the Division of Forestry of the Territory have continued along the same general lines of forest protection and administration and forest extension, but perhaps with greater speed and more expansion than during previous years.

Forest Protection.

The chief activity in this direction has been the construction of efficient barriers along the boundaries of government lands in forest reserves where they are in danger from damage by stock. To this end the following new fences were constructed during the calendar year 1916 to date:

Island	Forest Reserve	Location	Miles of New Fence
Kauai	Moloaa	Aliomanu	.32
Oahu	Lualualei	Lualualei	1.40
Oahu	Honolulu Watershed	Palolo	.41
Oahu	Honolulu Watershed	Manoa	.41
Oahu	Manoa Ranger Station	Kahoiwai	.75
Hawaii	Olaa Forest Park	24 Miles	5.52
Hawaii	Upper Olaa	Ranger Station	.26
	Total		9.07

Existing fences on forest reserve boundaries were also repaired during the calendar year 1916 to date, as follows:

Island	Forest Reserve	Location	Miles
Oahu	Pupukea	Pupukea	1.70
Oahu	Lualualei	Lualualei	6.65
	Total		8.35

These two combined operations have resulted in placing effective fences along a total length of 17.42 miles of government forest reserve boundaries.

Two new forest reserves have been created during the year, the Round Top Forest Reserve consisting of 115 acres and the Manoa Ranger Station, which includes 15 acres. These bring the total area of proclaimed forest reserves in the Territory up to a total of 798,344 acres, of which 546,352 consist of government land.

On account of a comparatively wet summer, no forest fires occurred during the year and only two or three grass fires, which were soon extinguished, were reported to this office.

Forest Administration.

An important advance in forest protection and administration was made in April when the Governor approved Rule II of the Division of Forestry. This rule, which is based on the regulations of the U. S. Forest Service, which have been in effective use on the mainland for many years, forms a working basis for forest administration in the Territory, which, up to the time, this Division had lacked, and aims at the better administration and protection of government lands within the forest reserves. This rule is as follows:

Territory of Hawaii.

Board of Commissioners of Agriculture and Forestry.

Rule II. Division of Forestry.

The Board of Commissioners of Agriculture and Forestry hereby makes the following rule and regulation for the preservation and administration of forest reserves:

Section 1. The following acts are hereby forbidden on government lands in forest reserves of the Territory of Hawaii and declared to constitute trespass punishable by fine:

(a) The cutting, killing, destroying, girdling, chopping, injuring or otherwise damaging, or the removal, of any timber, young tree growth, or any other material, except as authorized by permit from the Superintendent of Forestry.

(b) The grazing of any livestock, except as authorized by permit from the Superintendent of Forestry.

(c) The hunting of any wild animals, except as authorized by permit from the Superintendent of Forestry.

(d) Having or leaving in an exposed or insanitary condition camp refuse or debris of any description, or depositing or being or going thereon and depositing in the streams or other waters within or bordering upon government lands in the forest reserves any

substance or substances which pollute or are liable to cause pollution of the said streams or waters.

(e) The going on or being upon government lands within a forest reserve with intent to destroy, molest, disturb, or injure property belonging to the Territory of Hawaii, or used by the Territory of Hawaii in the administration of the forest reserves.

(f) The wilful tearing down, defacing, or disturbing of any public notice or survey monument posted within a forest reserve.

(g) Squatting upon government land in a forest reserve, or constructing or maintaining any kind of works, structure, fence, inclosure, road or trail, without a permit, except as otherwise allowed by law.

(h) The tearing down, breaking down or through, or molesting in any manner of a forest reserve boundary fence or gate or a fence or gate on government land within a forest reserve.

Section 2. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00), as provided by Section 529, Revised Laws of Hawaii of 1915.

Section 3. This rule shall take effect upon its approval by the Governor.

Approved:

LUCIUS E. PINKHAM,
Governor.

Honolulu, Territory of Hawaii, April 5, 1916.

To enforce the provisions of this rule one Forest Ranger was appointed during 1916 in addition to the four who were already on the staff. Two more rangers are just about to be appointed and this will bring the force up to the full strength needed for the present, which will then be as follows: One on Kauai, three on Oahu, two on Maui, and one on Hawaii. The rule so far has worked out well and legitimate enterprises which can be carried on without detriment to the forest have been legalized by the issuing of permits.

Forest Extension.

The raising and sale at cost of tree seedlings to the plantations and others by the forest nursery force has continued to be the chief activity in forest extension by the government, although actual planting on forest reserves on Kauai and Oahu has been done during the year using native trees, such as koa and kukui, for watershed cover and introduced trees for windbreaks and the production of fuel wood and timber.

A grand total of 247,432 trees were raised and distributed from the government nurseries during the calendar year 1915. This is over 30,000 more than the number distributed in 1914. The indications are that during 1916 this number will be considerably

greater since one plantation alone has placed an order for 350,000 seedlings, which is rapidly being filled. This all goes to show that interest in tree planting and more particularly for fuel production is decidedly on the increase. Of the total number of trees distributed in 1915, 62 per cent. was received by sugar plantation and ranch companies and almost half of the trees consisted of the swamp mahogany, *Eucalyptus robusta,* an adaptable and fast-growing fuel and timber producer.

During the calendar year, 1915, from reports that have been sent in to this office, the sugar plantation companies planted out 143,458 more trees than in 1914, as follows:

Number of Trees Planted in the Territory by Sugar Plantation Companies in 1915.

Hawaii—		
Hamakua Mill Company	2,000	
Hawaiian Agricultural Company	6,000	
Hawi Mill & Plantation Company	1,500	
Hutchinson Sugar Plantation Company	2,000	
Kaiwiki Sugar Company	1,000	
Kohala Sugar Company	12,000	
Niulii Plantation	5,800	30,300
Maui—		
Hawaiian Commercial & Sugar Company	5,000	
Kaeleku Sugar Company	1,106	
Maui Agricultural Company	243,536	
Pioneer Mill Company	1,500	
Wailuku Sugar Company	13,673	264,815
Oahu—		
Honolulu Plantation Company	350,000	
Laie Plantation	1,000	
Waialua Agricultural Company	9,739	360,739
Kauai—		
Grove Farm Plantation	25,000	
Kekaha Sugar Company	1,000	
Kilauea Sugar Plantation Company	3,000	
Koloa Sugar Company	100	
Makee Sugar Company	25,600	
McBryde Sugar Company	12,320	67,020
Total for all islands		722,874

The sugar plantations set out 83 per cent. of the total number of 874,489 trees planted in the Territory during 1915. The balance was planted by ranch companies, by the Division of

Forestry and individuals. It is interesting to note that, for the main purpose of planting, 53 per cent. of this total number of trees was set out for fuel production, 32 per cent. for watershed cover, 8 per cent. for windbreaks, 5 per cent. for timber, and 2 per cent. for ornament; and that of the different species planted, the swamp mahogany headed the list at 52 per cent.

Fuel Study.

The question of where to obtain a sufficient supply of cheap fuel mainly for the use of plantation laborers is still vital in many parts of the islands. To this end a study of the situation was inaugurated last March by the Division of Forestry in the effort to offer measures of relief. A list of questions to be answered was sent out to all of the sugar plantation companies in the attempt to secure data on which to sum up the situation and base offers of a practical remedy. So far 50 of the plantation managers have generously responded with their replies and as soon as the few remaining ones have been heard from, the material will be compiled, remedial measures recommended and the whole will be published for distribution.

Tree Study.

You doubtless will be interested in knowing what action has been taken as a result of the resolution, passed at the last meeting of your Association, concerning an investigation of the best kinds of trees to plant in given localities for specific purposes. The subject was not officially brought to the attention of the Board of Agriculture and Forestry until March of this year, when a letter from your assistant secretary was received. The matter was at once presented to the Board with a recommendation that the investigation be undertaken. The Board referred the matter to a committee, which, owing to the absence from the Territory of some of its members for several months, did not take action until the Board meeting of October 5, when it was voted to accept the suggestion of making the investigation in coöperation with the College of Hawaii. I was then also instructed to prepare a working plan for this investigation. This has been done, and it is now being commented on by the Commissioners and it is possible that it will be approved at the Board meeting to be held next week, when the investigation can be begun. The College of Hawaii has kindly consented to conduct the necessary technical wood tests and Mr. Rock to assist with his botanical advice in connection with this investigation.

Anticipating the approval of this project, considerable progress has already been made along the lines of this investigation, which would have been undertaken anyway in connection with the regular work of this Division, as follows:

A small sawmill has been ordered which will be installed at the Makiki Nursery where logs can be sawed up and wood specimens prepared for testing.

A watch has constantly been kept out for the trees that have been cut in and around Honolulu and log sections have been obtained from nine different species of timber trees, such as the kauri, Cook and Moreton Bay pines, and silk oak. These will be added to and will form the nucleus of the wood technology end of this investigation.

Progress has been made also in the tree introduction end of this work by the raising and planting out of trees, known to have a good timber value, in places where they will be cared for and observed.

At the Keanakolu Nursery on the slopes of Mauna Kea, Hawaii, Mr. Alfred W. Carter is kindly assisting by raising a quantity of seedlings, for planting out at the higher elevations, of the following species of timber trees:

1. Himalayan cypress, *Cupressus torulosa,* from India.
2. Himalayan silver fir, *Abies Webbiana,* from India.
3. Norway spruce, *Picea excelsa,* from India.
4. Benguet pine, *Pinus insularis,* from the Philippines.

These will be added to as opportunity offers.

Through the kindness of Mr. A. W. van Valkenburg and Mr. E. C. Smith, a quantity of seed, personally collected in Australia by Mr. Smith, of the Australian red cedar, *Cedrela australis,* akin to the Spanish cedar used for cigar boxes, has been turned over to this Division and from it thousands of young seedlings have been raised. In order to test out this species in as many different localities as possible, letters have been addressed to the enthusiastic tree planters of the Territory and eighteen have kindly consented each to plant out several hundred of the trees, to care for them, and report on their growth from time to time. This red cedar is considered to produce the most valuable timber in New South Wales. The wood is equal to mahogany but lighter in weight, is easily worked, seasons well, is durable, and is used for furniture, interior finish, carriage building, and a variety of other uses. It should be a distinct addition to our timber flora.

Mr. J. F. Rock, our Consulting Botanist, has also recently brought back from Manila many seedlings of Philippine timber trees. These will soon be planted at a high elevation on Tantalus, where they can be cared for and kept under observation.

At the Manoa Ranger Station eight quarter-acre plots have been staked and are now being planted to eight promising species of timber trees, the growth of which it is desired to test out under forest conditions and close observation. Smaller numbers of about forty other species of trees, which have been grown from seed obtained all over the world and have accumulated at the Makiki Nursery, will also soon be planted out at this station in order to ascertain their value for general planting in the Territory.

Very sincerely yours,

C. S. Judd,
Superintendent of Forestry.

Tree Investigation

The working plan, referred to in the foregoing letter, of an investigation to determine the different species of trees which are best adapted in the different parts of the Territory for different specific purposes, was approved by the Board of Commissioners of Agriculture and Forestry on November 28, 1916, and is as follows:

Working Plan of an Investigation to Determine the Different Species of Trees Which are Best Adapted in the Different Parts of the Territory of Hawaii for:

I. The conservation of water and the protection of watersheds.

II. The prevention of sand or dust drifting.

III. The re-forestation of eroded and arid areas on slopes of mountain ranges and on plains.

IV. The production of firewood.

V. The production of timber, fence posts, railroad ties and telephone poles.

To be conducted by the Division of Forestry with coöperative assistance from the College of Hawaii by furnishing botanical advice and conducting wood technology tests.

It is assumed that only those species of trees will be considered which have the ability to grow under the different conditions, which are easily propagated from seed or slip, are readily handled in planting operations, and the seed or slips of which are readily obtainable.

In presenting names of trees, both the common and botanical names should be given in order to avoid any confusion.

For convenience in this investigation the islands are divided into the following main regions and the finally determined species of trees should be tabulated by these regions:

1. The wet regions bearing water producing or protection forests.
2. The regions bearing non-water producing or commercial forests.
3. The arid and exposed regions.

I. The Conservation of Water and the Protection of Watersheds.

Prepare a list of both indigenous and introduced tropical and sub-tropical trees, which from actual observation and study are already known to be suitable for forest cover on water-producing areas at various elevations.

Extend the list, so obtained, by a series of further observations during the period of this investigation.

Assistance and technical advice as to suitable species and known habits of these should be obtained from the College of Hawaii botanist who is also the consulting botanist of the Division of Forestry.

II. The Prevention of Sand or Dust Drifting.

Prepare a list of both indigenous and introduced tropical and sub-tropical trees, which from actual observation and study are known to be suitable for dry and for sandy situations and which at the same time have the ability to withstand the wind and form a screen to protect loose sand and dust.

Extend the list, so obtained, by a series of planting experiments, as opportunity affords, on representative situations.

III. The Re-forestation of Eroded and Arid Areas on Slopes of Mountain Ranges and on Plains.

Prepare a list of both indigenous and tropical and sub-tropical introduced trees, which from actual observation may be planted on the arid and eroded areas on mountain sides and slopes, etc., as for instance sections of Waianae Mountains and other localities.

Assistance and technical advice as to suitable species and known habits of these should be obtained from the College of Hawaii botanist who is also the consulting botanist of the Division of Forestry.

IV. The Production of Firewood.

Prepare a list of both indigenous and introduced trees which are known by experience to be good producers of firewood. These to be planted below areas reserved or intended for water conservation. They should be planted in sufficiently large areas or copses to meet all the requirements of adjacent householders and tenants on lands where planted.

Such list is to be arranged according to the calorific value of the wood produced by each species and the specific gravity of each to be given at the same time.

The calorific value and specific gravity to be determined by the College of Hawaii from samples of wood furnished by the Division of Forestry.

V. The Production of Timber, Fence Posts, Railroad Ties and Telephone Poles.

Prepare a list showing, from past usage, what indigenous trees are suitable for the above purposes. (With the possible exception of mamane and ohia lehua for fence posts it is presumed that

indigenous trees will not constitute much of a factor in this part of the investigation because of the apparent failure of past logging operations and of the desirability of maintaining, in most parts of the Territory, our indigenous forest as a water conserver.)

Prepare a list showing the following qualities of the wood of whatever introduced trees growing in the Territory is available:

1. *Timber:*

a. Sizes of timber obtainable.

b. Seasoning ability.

c. Strength:

(1.) Compression—crushing strength along the grain, lbs. per sq. in.

(2.) Transverse or cross-breaking strength, lbs. per sq. in. (These strength tests to be performed by the College of Hawaii on material furnished by the Division of Forestry. Douglas fir timber to be used as a comparative check.

2. *Fence Posts:*

a. Sizes of posts obtainable.

b. Rate of growth.

c. Durability:

(1.) Round peeled posts, seasoned and unseasoned.

(2.) Squared posts, seasoned and unseasoned. (Redwood to be used as a comparative check.)

3. *Railroad Ties:*

a. Sizes of ties obtainable.

b. Rate of growth.

c. Durability, seasoned and unseasoned. (Redwood to be used as a comparative check.)

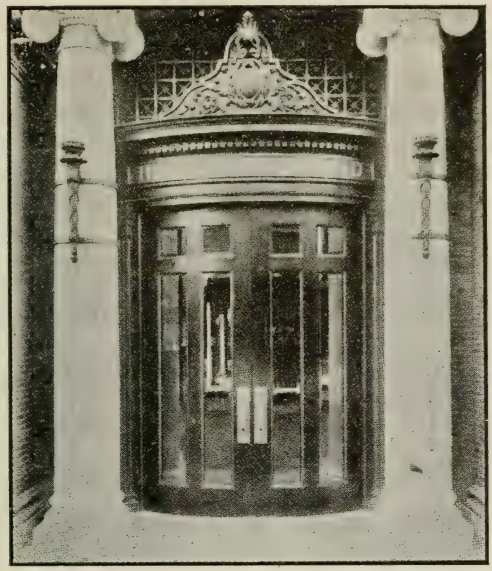
d. Spike holding properties. (This test to be performed by the College of Hawaii on material furnished by the Division of Forestry.)

4. *Telephone Poles:*

a. Sizes of poles obtainable.

b. Rate of growth.

c. Durability, seasoned and unseasoned. (Redwood to be used as a comparative check.)



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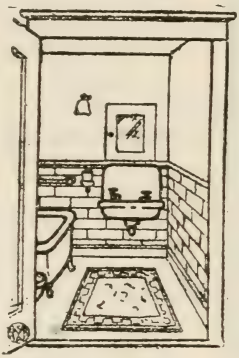
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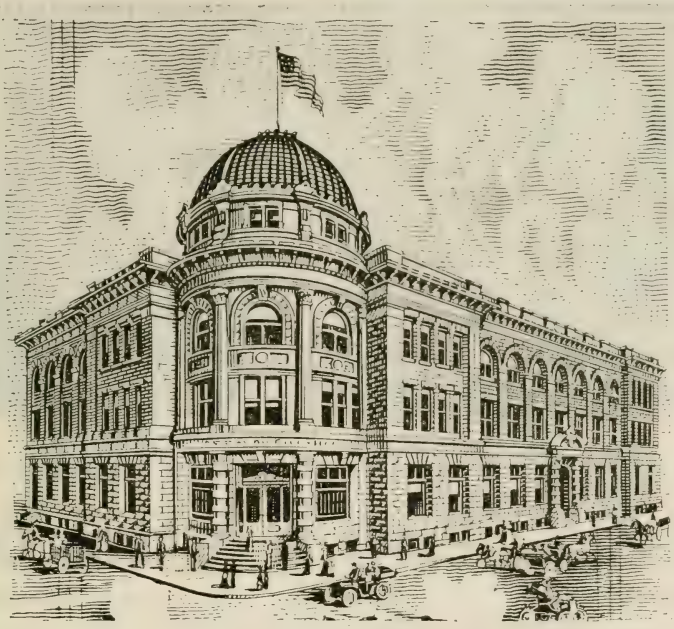
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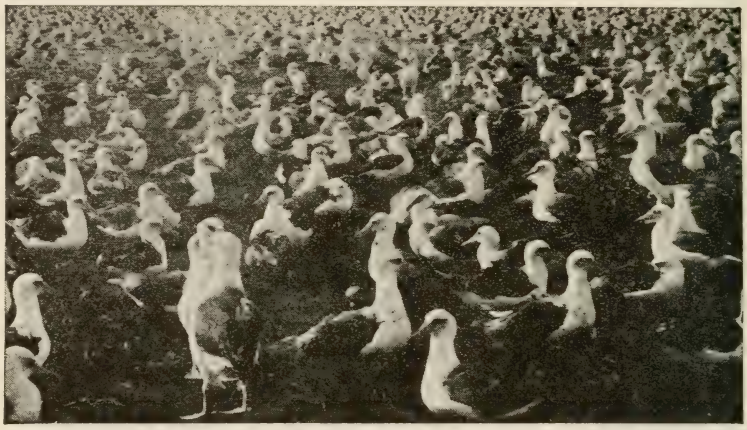
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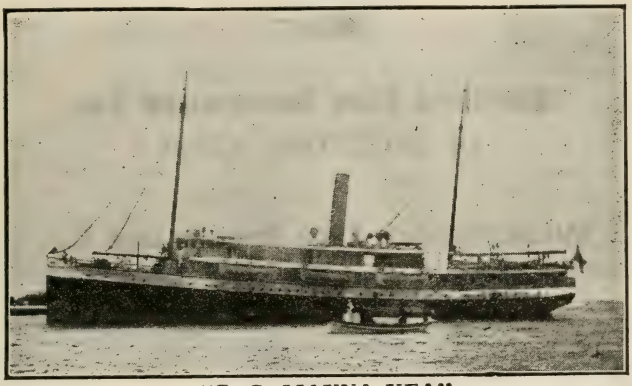
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THE HAWAIIAN FORESTER AND AGRICULTURIST

DECEMBER, 1916

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII. HONOLULU, DECEMBER, 1916. NO. 12

The first Maui County Fair, held at Wailuku on November 30 and December 1 and 2, proved a great success, and, as pointed out in the report of the Territorial veterinarian in this issue, this county can well lay claim to leadership in the breeding of thoroughbred horses. The exhibit of hogs at this fair was also a revelation and indicated the possibilities of the pork industry in the Territory.

The securing of a preventive vaccine for swine plague by the Territorial veterinarian should be a boon to those hog raisers in the Islands who have suffered losses from this disease.

In the appointment of Mr. James Lindsay as forest ranger for Maui, the Board has secured a capable and efficient officer and has taken a further advance step in the better protection and administration of the forest reserves throughout the Territory.

Arbor Day was celebrated on November 17, and for planting on this day the forest nurseryman distributed 19,297 trees from the government nursery. This is only 1286 short of the number of trees distributed for this purpose last year, and shows that considerable interest is still shown in the celebration of this worthy day.

The paper of the Territorial veterinarian, printed in this issue, on the milk supply of the Territory in relation to bovine tuberculosis, delivered at the annual meeting of the Hawaiian Medical Association, will be of great interest to all who desire to see clean milk assured by the eradication of bovine tuberculosis.

The superintendent of hydrography's article on water-measuring devices, printed in this issue, presents a concise statement of the different methods of measuring water under differing conditions and will doubtless be read with interest by many water users.

Division of Forestry

Honolulu, Dec. 14, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of November, 1916.

MAUI TRIP.

During the month I made a long-planned-for trip to Maui in order to get into closer touch with the forest situation on that island. During the time from November 13 to 18 I visited the Koolau, Makawao, West Maui, and Kula forest reserves and, through the kindness of Messrs. H. A. Baldwin and H. W. Rice, was enabled to see a great deal of forest conditions on Maui.

One of the chief objects of this trip was to select a suitable man for forest ranger on this island, and after looking over possible candidates I decided on Mr. James Lindsay of Haiku and talked over the work with him. You have since then approved his appointment to this position. Mr. Lindsay is a trained horticulturist, is much interested in forest work, and has had considerable experience in forest planting on Maui and elsewhere, and in him the Board has an officer well qualified for the position.

With Mr. W. F. Pogue I went along the Koolau ditch trail as far as Honomanu and inspected the windbreaks that were planted in coöperation with this division and found them growing well and in excellent condition. It was a pleasurable satisfaction to note also how splendidly the young native trees and undergrowth are coming up on the area where all plant growth died off several years ago.

A visit to Kailiili disclosed the hundreds of acres of splendid planted forests which have been established by the Maui Agricultural Company for fuel and watershed cover. Here also I inspected the plantations of a variety of eucalypts and other trees which were set out by Mr. Hannestad on government land.

In this region I also looked over a tract of about 275 acres of vacant government land which I propose to recommend be added to the present Makawao forest reserve. This land, which is between the new homestead tract, about to be opened, and the private land of Haiku, consists of water-producing gulches on the slopes of which are sections of native forests well worth preserving.

A short visit was made to a part of the Kula forest reserve near Polipoli spring. At the present time the neighboring ranchmen are getting out, with more or less success, the wild cattle which have been in this reserve for many years. When this work is

completed it is my plan to make a start in with the tree planting on this reserve, the main object for which this land was set aside. On account of the high elevation, over 5000 feet above the sea, this land was proclaimed a forest reserve because it can be made to grow, economically, valuable forest trees and because of the possible favorable influence which a forest cover might exert on the local climate of Kula, where water is at a premium. To use the land for any other purpose, in my opinion, would be a mistake. The first step necessary to tree planting would be to establish a small nursery on the reserve, where suitable trees could be raised from seed right at the place where they are to be planted out.

PROPOSED HAUULA FOREST RESERVE.

One day was spent examining the government land back of the Hauula homesteads, Oahu, which, in 1913, it was proposed to add to the Kaipapau reserve by proclamation. At that time the homesteaders desired to use the lower part of the land for grazing purpose and, with the governor's consent, the land commissioner gave them permission to do so, provided they build the necessary fences mauka across the land to keep the stock from getting into the native forest. My examination disclosed the fact that these fences have not been constructed and that cattle and horses are grazing upon the land. I have taken up the matter with the homesteaders to ascertain what they intend to do in the matter and to decide upon the proper steps necessary to protect the native forest.

TANTALUS FOREST.

In company with the forest nurseryman and Tantalus forest ranger I marked for cutting 10 trees along the road in the eucalyptus forest on Tantalus, where they are growing thick, in order to let the sunlight reach the road and dry up the mud. The 25 posts which can be cut from these trees will be used by Mr. Allan Herbert in the construction of a rest house and shelter which he has kindly offered to erect on Round Top.

MANOA RANGER STATION.

On November 21 a gang of four tree-planters began digging holes on a part of the Manoa ranger station where native trees and a great variety of introduced trees which have been accumulated at the Makiki nursery will soon be planted out to test their growth and adaptiveness to this region.

TREE STUDY.

A working plan for the tree study which was suggested by the Hawaiian Sugar Planters' Association to ascertain the species of trees best adapted to different specific purposes was prepared

during the month and has already received your approval. The investigation will now proceed with the coöperation of the College of Hawaii in supplying botanical advice and conducting the timber tests.

SANDALWOOD BULLETIN.

The manuscript prepared by Consulting Botanist J. F. Rock on "The Sandalwoods of Hawaii" received a final editing and was handed in to the printer to be published as Botanical Bulletin No. 3 of the Division of Forestry.

CIRCULAR LETTERS.

In order to get into closer touch with the volunteer district fire wardens and district foresters in the best interests of forestry in the Territory, circular letters were sent out during the month to each class of officers, the replies from which should furnish a large amount of information, which will be useful in the work of forest protection and administration.

ARBOR DAY.

Arbor Day was observed on November 17, and for planting on this occasion the forest nurseryman distributed from the government nursery over 19,000 ornamental, shade and forest trees, which is only a little short of the number sent out for this purpose last year.

KAUAI TRIP.

On December 12 I am planning to visit the region on Kauai back of the Waimea canyon with the land commissioner and superintendent of hydrography in order to get perfectly familiar with the region and to collect data which will enable me to make suitable recommendations for handling the summer camp situation which will come up in this region at the expiration of the present leases.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

FOREST NURSERYMAN'S REPORT.

Superintendent of Forestry, Board of Agriculture and Forestry,
Honolulu.

Dear Sir:—I herewith submit a report of the principal work done during the month of November:

NURSERY.

Distribution of Plants.

Sold	110	pot-grown plants
Gratis	508	pot-grown plants
Total	618	pot-grown plants

In addition to the above, 19,297 trees were distributed for Arbor Day planting, full account of which is given in the attached report on Arbor Day.

Collections.

Collections on account of plants sold amounted to	$ 2.15
Rent of office building in nursery grounds	35.00
Total	$37.15

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 40,000 seedlings, consisting of eucalyptus and ironwood.

MAKIKI STATION.

Preparations are being made at this station for the installing of a short log saw mill. Slight additions and alterations will have to be made to the buildings. This work will be done by our own men. During the first two weeks of November the men at this station were assisting with Arbor Day work.

HONOLULU WATERSHED PLANTING.

The work done during the month has been as follows: Clearing away grass and weeds from the young trees, planting and straightening up those that are being shaken and damaged by the wind. All the area planted is now in very good condition, and with the exception of a little clearing away of the vines now and again, the trees are practically able to take care of themselves. The small nursery at the base of Sugar Loaf is well stocked with koa trees, and we intend soon to commence planting up other bare places.

ADVICE AND ASSISTANCE.

Work connected with Arbor Day has taken up most of the writer's time. The following is a list of calls made and advice given: Calls made, 4; advice by telephone, 9; advice by letter, 7; people calling at nursery, 11. Total, 31.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, Nov. 30, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of November, 1916, as follows:

During the month there arrived at the port of Honolulu, 57 vessels, of which 29 carried vegetable matter. Of these vessels, seven passed by the way of the Panama Canal in transit to the Orient.

Disposals.	Lots.	Parcels.
Passed as free from pests	1164	25,202
Fumigated	5	2,117
Burned	10	11
Returned as contraband	4	6
Total inspected	1183	27,336

Of these shipments, 27,014 packages arrived as freight, 174 packages as mail matter, and 148 packages as baggage of passengers and immigrants.

RICE AND BEAN SHIPMENTS.

During the month 37,317 bags of rice and 1183 bags of beans arrived from Oriental ports and after careful inspection were passed as free from pests.

PESTS INTERCEPTED.

Approximately 3778 pieces of baggage belonging to passengers and immigrants from foreign countries were examined, and nine packages of fruit and one package of vegetables were seized and burned.

One package of walnuts was taken in the baggage of a passenger from China. These were infested with the larvae of *Ephestia slutella*. Three packages of chestnuts in the baggage of passengers on three vessels from Japan were infested with the chestnut weevil (*Balanimus* species) and were destroyed by fumigating first and then burning. One box of violet plants from the Coast were found infested with *Aphids* and were fumigated before delivery.

One case of orchids from New Jersey had to be fumigated before delivery on account of finding a few infested with an aphis (*Cerataphis lataniae*) and a scale insect (*Coccus longulus*). Five small sago palms (*Cycas revoluta*) were found in the baggage of a passenger from Japan and were fumigated and all soil removed and replaced with sterilized soil before they were landed.

Twenty-one hundred coconuts for planting arrived from Pa-

nama on November 24. These were fumigated as a precautionary measure before delivery. Ten coconuts were found in the baggage of a passenger from American Samoa. They were samples for a fiber company and were fumigated before delivery, as one showed infestation with a scale (*Aspidiotus destructor*).

The following packages of plants and seeds were returned by the postoffice: 1 package of corn from Manila; 1 package of plant cuttings from Japan; 1 package of nuts from Japan.

On November 28, just when the Sonoma was sailing at 10 o'clock p. m., a member of the crew tried to land three alligator pears from Samoa. They were seized and have been destroyed. During the day two other attempts were made to land these fruits, but the packages containing them were sent back on board.

HILO INSPECTION.

Brother M. Newell of Hilo reports the arrival of five steamers, three of which brought vegetable matter, consisting of 218 lots and 3141 packages of fruits and vegetables. One package of plants had to be fumigated before delivery on account of mealy bug infestation. All of the rest was passed as free from pests.

INTER-ISLAND INSPECTION.

Sixty-five steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	540	bags
Plants	317	boxes
Vegetables	150	boxes
Fruit	7	boxes
Total passed	1014	packages

The following packages were refused shipment, as they did not meet with the regulations pertaining to soil and infestations:

Plants	16	packages
Fruit	10	packages
Total refused	26	packages

PLANT INSPECTION QUARTERS.

During the month I have been compelled to remove the laboratory and fumigating chamber located on Pier No. 10 (Oceanic dock). The laboratory was carefully taken down and stored. The fumigating chamber was removed to the Kilauea-street lot and a roof built over same. This is a condition which had to be complied with on account of harbor improvements, and, unfortunately, it very materially weakens the equipment of the quarantine work.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Plant Inspection.

Division of Entomology

Honolulu, Dec. 18, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—During the month of November the insectary was engaged in multiplying and distributing the melon fly parasite, *Opius fletcheri*. There were produced 2861 females and 2405 males, and the distribution was as follows:

	Females.	Males.
Opius fletcheri.		
Oahu:		
S. King street	150	100
Sheridan street	963	675
Kalakaua avenue	445	290
Moanalua	275	150
Alewa Heights	300	200
Kaimuki	100	65
Schofield Barracks	100	100
Hawaii:		
Hilo	75	40
Maui:		
Wailuku	200	100
Total	2608	1720

Fruit fly parasites were propagated and distributed as follows:

Tetrastichus.	
Oahu:	
Punahou Street	300
Alewa Heights	300
Maui:	
Iao Valley	200
Galesus Silvestri.	
Pauoa Valley	96
Dirhinus Giffardii.	
Maui:	
Iao Valley	250
D. fullawayi.	
Oahu:	
Punahou street	2
Maui:	
Iao Valley	78

D. tryoni.

Oahu:	
Punahou street	123
Maui:	
Iao Valley	105

Opius humilis.

Oahu:	
Punahou street	12
Total	1466

The corn leaf hopper egg parasite has multiplied very satisfactorily at the nursery in Makiki Valley and has been distributed in a number of localities during the month: 100 to Kailua (Mr. Rice), 100 in the corn fields near Kalakaua and King, 20 to U. S. Experiment Station behind Punchbowl, 200 to Waiakoa, Kula, and 50 to Haiku, in the Island of Maui.

Respectfully submitted,

D. T. Fullaway,
Entomologist.

Division of Animal Industry

Honolulu, Dec. 20, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I have the honor to submit herewith the report of the Division of Animal Industry for the month of November, 1916.

MAUI COUNTY FAIR.

Though this is the first time the County of Maui has ever attempted to gather its various industries and pursuits together for the purpose of exhibition, education and friendly competition, the effort proved a great success and will undoubtedly have far-reaching results. As one of the judges of the live stock exhibits the writer can unreservedly prophesy for Maui a place in the sun in so far as the breeding and development of pure-bred animals—whether for sport, utility or meat food purposes—are concerned. That Maui already can lay claim to the lead where thoroughbred horses is the question cannot be disputed, and some of the classes of both imported and Hawaiian-bred stallions, mares and colts would have aroused enthusiasm anywhere in the world where a good horse is appreciated. With such a foundation and with the spirit of true sportsmanship which seems to pervade all Maui, the annual exhibitions which now are insured, together with fully developed competitive performances along the lines of speed, skill and daring on the part of man and mount, cannot fail to bring back the horse to the position which it deserves to fill, as the most beautiful animal in creation.

The cattle exhibits, whether for beef or dairy purposes, fell far behind the horses. Among the beef classes Herefords and Shorthorns were not even represented, Devons had barely a look-in, and the day was saved only by two good exhibits, with many classes filled, of Polled Angus, pure-bred breeding animals as well as the finished product—the fat steer.

The dairy breeds also were poorly represented, only one real good exhibit of Jersey cattle being shown.

This weakness in the cattle exhibits, however, does not necessarily denote lack of interest in the dairy business, but only a lack of experience when the question is to exhibit. Dairy animals are notoriously the most difficult and the most expensive animals to exhibit, as they often require extensive preparations for their care and comfort while away from home. This is especially the case when animals in milk are exhibited, and until more permanent quarters have been secured for the annual show, a regular dairy exhibit must wait, and there can be no doubt that next year's fair will see all the cattle classes filled to a far greater extent than was the case this time. It should also be mentioned that the beef cattle would have been fully represented this time, at least in so far as Herefords were concerned, except for the

failure of the two largest exhibitors to secure transportation for their animals, which had recently been exhibited on Hawaii.

The climax of the farm animal exhibits came with the hogs. Nearly all of the most popular breeds were well represented, and the competition for the ribbons and prizes was keen. Berkshires and Duroc Jerseys were the favorites and were almost equally strong in numbers as well as quality. That the Berkshires carried away most of the prizes was due principally to the personal preferences of a majority of the judges for this breed. A splendid exhibit of Hampshires attracted general and well-deserved attention, while Tamworth was represented by one boar and one sow only. Four pens of butcher hogs, three in each pen, gave the judges a bad half hour, as all were in splendid shape, but the blue and special finally went to the Berkshires, the three other pens being reds.

All in all, the whole hog exhibit was little short of a revelation and illustrates the great advance the pork industry has made throughout the Territory during the past few years, and complaints are already being voiced about a crowded market and falling prices, and still the local consumer has to pay thirty cents per pound for ham and bacon! Who will establish the first modern pork-packing house in the Territory and help conserve one of our most important meat food products in case importation should fail? There ought to be such an establishment on each of the principal islands.

And, in conclusion, during the entire fair not a single case of sickness was heard of, even though hogs of all ages and classes were brought from all over Maui, which speaks well for the general health of the hogs on Maui, as well as for the sanitary arrangements of the local health committee.

Of other live stock exhibited, a few sheep became of temporary interest only while serving in a sheep-shearing competition. Far more attention was given to eleven well-filled classes of rabbits and Belgian rabbits and Belgian hares, another meat food industry of comparatively recent date which also may become of considerable importance here in case of isolation. They increase very fast and mature or become ready for the table in one-third to one-half the time required by any kind of poultry. The hare and rabbit are essentially a poor man's pets, and the industry should be encouraged until a buck and a few does can be found in every back-yard and on every homestead. The conserving of rabbits in tin or glass containers has become a favorite juvenile industry throughout the United States, the federal department of agriculture having issued a farmers' bulletin containing full directions for rabbit culture and how to utilize them to best advantage.

Among the dogs exhibited, the pointers were by far predominating. Here, again, the lack of experience interfered, also the fact that many exhibitors had undertaken to bring too great a variety of both animals, poultry and produce to warrant each the

care and preparation which the experience of a few years will teach them are requisite for the gaining of an award.

The poultry show contained the usual varieties of chickens, ducks, turkeys and pigeons. The Indian duck seems to be a favorite on Maui, and much interest is also being taken in squab raising. For the latter purpose it is noted that the homer has almost been completely superseded by the Carneaux and White Kings. Both are beautiful birds and fast breeders of squabs weighing twelve to sixteen pounds per dozen when one month old.

In connection with the fair, though not on the grounds, this office (division of animal industry) had an exhibit of the lesions most commonly found in diseased animals in the Territory. The specimens were mounted in glass jars and provided with descriptive legends. It was, however, difficult to give much time to this exhibit, as the judging of all the live stock—that is, horses, cattle, sheep, swine, dogs and rabbits—had been delegated to the same judges, who, in spite of strenuous efforts, could not finish the lists of awards until the fair was ready to close up on the last day. These lists will be published in full in the *Hawaiian Forester and Agriculturist* as soon as space becomes available.

SWINE PLAGUE OR HEMORRHAGIC SEPTICEMIA IN HOGS.

As reported last month, this disease had made its appearance in two herds of swine where considerable losses of swine were sustained. Both were treated with hog cholera serum, but to little or no avail.

A cabled order for swine plague bacterin brought a limited amount of this preventive vaccine from Berkeley, California, but the same having been prepared from a cattle strain of the specific organisms, the results were not as satisfactory as could have been wished for. Now an order for 200 cc. of the real swine plague bacterin has been sent to Kansas City, and it is confidently hoped that the infectious pneumonia met with here during the cold winter months can be checked by its use. An article entitled "Swine Plague and its Treatment" will be reprinted in the next issue of the *Hawaiian Forester and Agriculturist.*

Respectfully submitted,

VICTOR A. NÖRGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Dec. 18, 1916.

Dr. Victor A. Nörgaard, Chief of Division of Animal Industry, Bureau of Agriculture and Forestry, Honolulu, T. H.

SIR:—I beg to submit the following report for the month of November, 1916:

TUBERCULOSIS CONTROL.

	T.	P.	C.
C. M. Cooke	1	1	0
Dr. Straub	24	22	2
A. F. Cooke	6	6	0
Oahu College	16	15	1
Geo. Holt	17	16	1

During the past month a total of 64 head of dairy cattle were tested, of which number 60 were passed and tagged and 4 condemned and branded.

POST MORTEM EXAMINATIONS.

Post mortem examination was performed on two condemned cows at the Waialae abattoir, with the following results:

No. 1. Lesions: One mediastinal lymph gland and a few nodules in the left lung.

No. 2. Could find nothing in what remained of the carcass, but the retropharyngeal glands were missing.

HOG INSPECTIONS.

A general inspection of hogs throughout Moiliili and a large part of Kalihi was made during the past month. Altogether, a total of 4862 head were inspected and without exception found in fine condition, no evidence of disease of any kind, nor did any obtainable history point to the presence of any disease among them for the past three or four years. With a few exceptions the sanitary conditions of the piggeries were good.

LIVE STOCK IMPORTATIONS.

S. S. Niagara, Vancouver—1 dog, J. M. Kelly.

S. S. Hyades, San Francisco—1 pony, Fred Anderson; 24 mules, 1 jackass, Alexander & Baldwin.

U. S. A. T. Dix, Seattle—6 horses, U. S. Q. M. Dept.

S. S. Matsonia, San Francisco—1 ct. poultry, W. F. X. Co.; 1 cat, F. Brown.

S. S. Wilhelmina, San Francisco—88 cts. poultry.

S. S. Shinyo Maru, Orient—1 dog, Miss Dorothy Martin.

S. S. Manoa, San Francisco—77 cts. poultry, Honolulu; 5 cts. poultry, Kahului.

S. S. Makura, Vancouver—1 dog, J. K. Baker.

Respectfully submitted,

L. N. Case,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Dec. 12, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—The following report of operations of the division of hydrography during November, 1916, is submitted:

WEATHER CONDITIONS.

With the exception of Kohala, Hawaii, practically all parts of the Territory received an abundance of rainfall without experiencing heavy floods. Practically all streams are above normal.

MAUI COUNTY FAIR EXHIBIT.

An exhibit was shown at the Maui County Fair, consisting of 25 large transparencies showing both mainland and local field work methods and results obtained therefrom, water-measuring instruments, rain gages and methods of working up field data into detailed reports.

The exhibit was visited by about six thousand persons.

OPERATION AND MAINTENANCE WORK.

Kauai. The Hanalei and Olokele stream-gaging stations were repaired and about twelve miles of trail in the upper Waioli, Hanalei and Kalihiwai valleys were cleared and repaired.

At the suggestion of the governor of Hawaii, maximum and minimum thermometers were established at Kokee, near the center of the proposed Waimea park site, at the head of Waimea canyon.

Twenty-six stream and ditch-measurement stations and seven rain-measurement stations were visited and 28 measurements were made.

Oahu. All stations on the island were visited and ten measurements were made. Four rainfall-measurement stations were also visited.

Blue-print copies of data for the year ending June 30, 1916, for the north and south forks of the Kaukonahua streams were prepared and furnished to the Wahiawa Water Co., Ltd., and the U. S. Army.

Only minor repair work was done.

Maui. The superintendent attended to the usual routine operation and maintenance work, visiting 17 stream-measurement stations and one rainfall station. Estimates were made for considerable repair work needed during December and January. Arrangements were also completed for the purchase of a saddle horse by Mr. W. F. Pogue, for the use of employes of this division in the ditch country.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

Arbor Day

Honolulu, Dec. 1, 1916.

C. S. Judd, Esq., Superintendent of Forestry, Board of Agriculture and Forestry, Honolulu.

Dear Sir:—In accordance with a proclamation by Governor Pinkham, Arbor Day was celebrated on November 17. Several weeks previous to that date the different newspapers in the city of Honolulu and also on the other islands were informed that trees would be available as usual at the government nursery in Honolulu and also at the two sub-nurseries, one in Hilo, Hawaii, and the other in Homestead, Kauai. Through the kindness of the press the general public was informed of the species available and the conditions regarding shipment and so forth. A large number of people took advantage of the offer and shipments of plants were sent to all the islands.

The schools of the Territory came in for their share, although many of the school grounds are now well stocked and there is little room left for tree planting. The total number of trees applied for by schools amounted to 1957. Homesteaders on all of the islands drew heavily on our stock. The trees mostly wanted by them consisted of eucalyptus robusta, ironwoods and grevilleas. The amount of trees supplied to the different military posts was not so large as last year. This was probably due to the fact that they have been receiving large quantities of trees during the year at intervals.

The total number of trees distributed amounted to 19,297, and the number sent to each island is as follows, including schools:

	Trees.
Oahu, including Honolulu	9,537
Kauai	1,649
Maui	4,044
Hawaii	3,997
Molokai	70
Total	19,297

Of the above the following went to schools:

Island.	Schools.	Trees.
Oahu, including Honolulu	20	547
Kauai	4	64
Maui	13	1079
Hawaii	6	197
Molokai	1	70
Total	44	1957

Distribution of trees by species from the government nursery, Oahu, for planting on Arbor Day, was as follows:

Golden Shower (*Cassia fistula*)	691
Pink Shower (*Cassia grandis*)	602
Pink and White Shower (*Cassia nodosa*)	462
Royal Poinciana (*Poinciana regia*)	585
Yellow Poinciana (*Peltophorum ferrugineum*)	171
Jacaranda (*Jacaranda mimosaefolia*)	853
Pepper Tree (*Schinus molle*)	1,004
African Tulip Tree (*Spathodea companulata*)	1,024
St. Thomas Tree (*Bauhinia tomentosa*)	310
Texas Umbrella (*Melia azedarach*)	291
Ear Pod Tree (*Enterolobium cyclocarpum*)	292
Silk Oak (*Grevillea robusta*)	1,956
Ironwood (*Casuarina equisetifolia*)	4,680
Japan Cedar (Sugi) (*Cryptomeria Japonica*)	704
Blue Gum (*Eucalyptus globulus*)	692
Lemon Gum (*Eucalyptus citriodora*)	783
Swamp Mahogany (*Eucalyptus robusta*)	3,033
Other species	1,164
Total	19,297

Respectfully submitted,

David Haughs,
Forest Nurseryman.

Bovine Tuberculosis and the Milk Supply of the Territory of Hawaii

By Victor A. Nörgaard, V.S. (Copenhagen),

Territorial Veterinarian.

(Delivered at the annual meeting of the Hawaiian Medical Assn.)

Gentlemen:—The efforts of the Board of Agriculture and Forestry at eradicating bovine tuberculosis have been continued during the past year along the same lines as reported to this association at the last two annual meetings.

While complete eradication cannot yet be reported, the number of dairies which may be said to be free from tuberculosis infection is steadily increasing and will, when the year's testing has been finished, be found to be close to 90 per cent. Of the 89 dairies tested up to this date, including all dairies in Honolulu and vicinity, 73, or 82 per cent, did not have a single reacting animal. Up to this date, November 25, a total of 4845 dairy animals have been tested, of which number 4700 were found healthy and 145 were condemned as tuberculous. Nearly all of these animals were butchered, and it is gratifying to state that only a very small number were found on post mortem examinations to have the disease in a sufficiently advanced state to warrant the condemnation of the entire carcass. The most common lesions were more or less extensive tubercular nodules in the retropharyngeal bronchial and mediastinal glands, and less frequently in the mesenteric, supramamary and prescapular glands. Tuberculous nodules in the lungs are becoming more rare with every year, and cases of open tuberculosis are hardly ever met with. It may, therefore, be taken for granted, that many of the dairies which still contained reactors this year, were freed of the infection with the removal of the infected animals and the thorough disinfection of the premises.

There still remain about 3000 head to be tested, the majority of which belong to the Railroad ranches and the rest to dairies beyond Ewa, in all of which few reactors will be found.

It will therefore be seen that the danger of transmitting bovine tuberculosis to children, with milk, even when uncooked or unpasteurized, has been diminished to a considerable extent when compared to the conditions obtaining here six years ago, when more than thirty per cent of the dairy cattle of Honolulu were tuberculous and many of them affected with advanced forms of the disease, such as tuberculosis of the milk glands (or udder).

A further safeguard against the disease is the excellent pasteurization plant installed by the Honolulu Dairymen's Association, where 83 per cent of all the milk consumed in Honolulu is handled. The Goucher electric milk purifier, mentioned in my previous papers before this association, has recently been replaced

with the best known pasteurizing plant on the holding system. The electric plant was a so-called flash pasteurizer, while the new one heats the milk for half an hour to a temperature of 145° F., thereby insuring the destruction of all pathogenic micro-organisms. The temperature and length of exposure is automatically registered and the record sheet filed daily with Food Commissioner Hanson. In a similar way all cream and butter fat mixtures entering into the manufacture of ice cream, are sterilized at a temperature of 160° F., a fact of importance, since the Rockefeller Institute found the principal lesions of poliomyelitis to be in the large intestines and surmised that ice cream might be one of the vehicles of infection.

While nothing but good can be said about this excellent plant of the Dairymen's Association, there is, nevertheless, one sinister aspect to it which I shall take the liberty to lay before you. I have been given to understand that a strenuous fight is going to be made before the next legislature for the purpose of abolishing the efforts of my office at eradicating bovine tuberculosis and substituting compulsory pasteurization of all milk. As stated, there still remain about 2 per cent of tuberculous dairy animals, or there did, at least, before the last test was made; at any rate, sufficient of a nest egg to start the disease spreading again. And while it has taken six years to reduce its prevalence from thirty per cent to two per cent, it may safely be predicted that it would take less than two years for it to regain its former status. It is, of course, possible for a dairyman to keep his herd free of tuberculous cattle, if he so desires, but when there is no inducement to do so, if pasteurized tuberculous milk is to rank even with clean milk from healthy cows, it is doubtful if many of them will go to the expense and trouble in connection with it. On the other hand, pasteurization cannot always be relied on; the plant might become incapacitated, and, if even for one day, unpleasant results might follow the consumption of a few thousand gallons of unpasteurized milk from a lot of diseased cows. I will therefore ask you gentlemen, singly as practising physicians, and as a body through your organizations, to help averting what I believe would be a very poor policy on the part of the dairymen and one far from their own interests. A sick cow cannot furnish the same quality of milk as a healthy one, and I am sure that most of your patients would prefer milk from healthy cows to that from tuberculous animals, even if rendered innocuous by pasteurization. To terminate the efforts of the Board of Agriculture at eradicating bovine tuberculosis at the present time, when a large majority of the diseased animals have already been disposed of and the possibility of their transmitting a fatal disease to the children, whose welfare it is our solemn duty to protect, can be viewed only as a step in the wrong direction. And what of the seventy or eighty dairymen who have already cleaned their herds of tuberculous animals? A barbed wire fence is poor protection against the badly infected tuberculous herd of a next-door neigh-

bor. And the many so-called "family cows," some of which, if they become infected from a nearby diseased herd, would almost be sure, sooner or later, to transmit tuberculosis with their milk, because, unlike the milk coming from a larger or smaller dairy, it would be consumed *undiluted,* day after day, by the same people or children. Of course, such milk could and should be pasteurized, but, gentlemen, you undoubtedly all know what home-pasteurization amounts to, especially when left to servants. Would it not be much safer to have healthy cows only?

In conclusion, I beg to reiterate my statement from last year: The milk consumer of Honolulu pays for *clean milk from healthy cows* and consequently is entitled to get *just that and nothing else.* Pasteurization and clarification are excellent adjuncts to safeguard the consumer against milk-borne diseases, but they should never be used as excuses for continuing a few diseased cows in otherwise healthy herds, as little as for filthy milking methods and dirty utensils.

As I fully believe, gentlemen, that you all agree with me that bovine tuberculosis must go, I venture again to ask for your support and coöperation to that end. I thank you for the opportunity to lay the matter before you and for your courteous attention.

DISCUSSION.

Dr. C. B. Wood: Mr. Chairman, I move that a copy of Dr. Nörgaard's paper be sent by this society to the daily papers, with the request that they publish it as part of the proceedings of this meeting.

Dr. W. C. Hobdy: I move to amend Dr. Wood's motion by adding the words, "with the endorsement of this society."

Dr. C. B. Wood: Amendment accepted.

Dr. A. N. Sinclair: I move to amend the amended motion by adding, "and that a copy of Dr. Nörgaard's paper be sent also to the governor, the president of the senate and the speaker of the house of representatives, and that the secretary be instructed to memorialize these gentlemen that any legislative or other action in any way unfavorable or obstructive to the Board of Agriculture's efforts at eradicating bovine tuberculosis will be viewed by this society as unwise and contrary to the welfare of the community, and that a copy of this resolution be forwarded to the president of the Board of Health."

Water-measuring Devices

By G. K. Larrison, Superintendent of Hydrography.

This paper is prepared for the purpose of providing for water users a brief non-technical description of the various devices now used for measuring water, and of the essential conditions under which each type should be used. In many instances it is impossible to determine the correct type of measurement device to be used without a careful investigation by a competent hydraulic engineer, and the reader is warned against relying on the suggestions contained herein for any specific problem without further technical advice.

All kinds of water measurements will be made under one of two conditions—either when the water is under pressure, as in pipes or other closed conduits, or when it is flowing with a free open surface, as in the case of streams, ditches, flumes, etc. The flow of water in the first case may change to the latter, as when the head on a pipe line has lowered so that the pipe is only partially filled.

MEASUREMENT OF FLOW IN PIPES UNDER PRESSURE.

A few of the basic principles of hydraulics are as follows:

1. Water confined in a tank, pipe, or other vessel will exert a pressure per square inch equal to the weight of a column of water one inch square and as long as the *vertical* distance between the surface of the water and the area under pressure, as long as this column of water is at a standstill. This pressure is also exerted in all directions, or against the sides of the vessel as well as the bottom. When the water is allowed to flow through the pipe or vessel, the pressure at any point decreases, due to the velocity of the flowing water.

2. It is commonly supposed that water will "seek its own level" or in case of an inverted pipe syphon the water will flow out of one end at the same level at which it enters the other end. This would be true if it were not for the fact that the sides of the pipe and the bends of the pipe exert a slowing down effect on account of friction, and in reality the water, when flowing, will not reach the same level as that at which it enters the pipe, although the same amount of water will flow out of the pipe as enters at the other end.

3. The friction factor is also of primary importance in determining the flow of water through pipes laid under all conditions of gradient and curvature. For pipes of the same materials, the larger the diameter of the pipe—all other things being equal—the less friction in proportion to the area of the pipe will occur and less loss of head will be the result.

For example: If two pipes, one of 2-inch and the other of 1-inch diameter, were laid from a common source, with identical gradients, and curvature, to similar tanks, the 2-inch pipe would

deliver to a higher elevation than the 1-inch pipe. If the interior surface of all pipes were so smooth as to be frictionless there would be no difference, but the proportion of resisting surface to the cross-sectional area of the passing water is so much greater in the 1-inch pipe than in the 2-inch pipe that the velocity is much slower and consequently the pressure much less.

This relation between the area and interior surface is known in hydraulics as the "hydraulic radius," and is an important factor in computing discharges. It is also used in computing the flow in open channels when the computation is based on the gradient or slope of the channel.

To measure the flow in a pipe or other conduit when the water is under pressure, a mechanical device of some sort which registers outside of the pipe the pressure of the water within, must be installed. These mechanical devices are of many types, varying with the size of the pipe, the pressures exerted, the use to which the water is put, etc. All types cause a small loss of pressure or head, but usually this loss is so small as to be considered negligible.

WATER METERS.

Meters used for measuring the quantity of water supplied to a house or factory are of the displacement type; that is, as the water passes through the meter it displaces or moves a piston, a wheel, or a valve, the motion of which is communicated through a train of clock wheels to dials where the quantity that has passed since a certain time is registered. There is no theoretical way of determining whether or not the readings of the dial hands are correct, but each meter must be rated by measuring the discharge in a tank. Several meters may be placed on the same pipe line in this operation, the same discharge then passing through each of them. When impure water passes through a meter for any length of time deposits are liable to impair the accuracy of its readings, and hence it should be rerated at intervals.

The piston type is one in which the motion of the water causes two pistons to move in opposite directions, the water leaving and entering the cylinder by ports which are opened and closed by slide valves somewhat similar to those used in the steam engine. The rotary meter has a wheel enclosed in a case so that it is caused to revolve as the water passes through. The screw meter has an encased helical surface that revolves on its axis as the water enters at one end and passes out at the other. The disk meter has a wabbling disk so arranged that its motion is communicated to a pin which moves in a circle. In all these, and in many other forms, it is intended that the motion given to the pointers on the dials shall be proportional to the volume of water passing through the meter. The dials may be arranged to read either cubic feet or gallons, as may be required by the consumers. These meters

are of different sizes, according to the quantity of water required to be registered.

PRESSURE GAGES.

A pressure gage, often called a piezometer, is an instrument for measuring the pressure of water in a pipe. The form most commonly found in the market has a dial and movable pointer, the dial being graduated to read pounds per square inch. The principle on which this gage acts is the same as that of the Richard aneroid barometer and the Bourdon steam gage. Within the case is a small coiled tube closed at one end, while the other end is attached to the opening through which the water is admitted. This tube has a tendency to straighten when under pressure, and thus its closed end moves and the motion is communicated to the pointer; when the pressure is relieved the tube assumes its original position and the pointer returns to zero. There is no theoretical method of determining the motion of the pointer due to a given pressure, and this is done by tests in which known pressures are employed, and accordingly the divisions of the graduated scale are usually unequal. These gages are liable to error after having been in use for some time, especially so at high pressures, and hence should be tested before and after any important series of experiments.

VENTURI METERS.

The Venturi meter is best adapted for measuring the flow in pipes of six inches or more in diameter. It may also be used for smaller pipes, but its cost usually makes its use for small pipes prohibitive. This meter has no interior mechanism, but consists of a section, inserted in the pipe, in which the cross-section is gradually contracted to a throat, usually one-ninth the area of the pipe, and is then uniformly increased until the original diameter of the pipe is reached. The distance between the upper end and the throat is less than the distance from the throat to the lower end. The pressures at the upper end at a point just before contraction begins, and at the throat, are registered by mercury pressure gages. By knowing these differences of pressures, or heads, and the respective areas of the pipe and the throat, the discharge may be computed by a simple formula. The Venturi meter has been thoroughly tested and is now the standard measuring device used in all large pipes and conduits. A modification of the Venturi meter for open ditch measurements has recently been experimented with and indications point to its success.

Another method of gaging the flow in pipes is by means of the Pitot tube, which, in its simplest form, consists of a bent tube, the end of which is placed so as to directly face the current in the pipe. The water pressure forces the water into the tube, and, by measuring this height and applying a simple formula, the velocity of the flow can be obtained. The Pitot tube is also used for obtaining the velocity of water in open channels.

The flow of water in open channels may be measured by four different methods:

Velocity-Area Method.

The velocity-area method involves the measurement of the cross-sectional area at any point in the channel and the mean velocity at this point with a current meter. This method involves a fairly permanent cross section, a record of surface fluctuations and sufficient measurements at varying stages of the flow to determine a rating curve and table.

This method is used exclusively by the U. S. Geological Survey and the Division of Hydrography in rating streams and ditches where prohibitive cost, lack of head room, or other reasons, prevents the installation of weirs. The rating of a stream or ditch by this method also requires considerable period of time in order that measurements may be made at sufficient varying stages of from extreme low water to high floods to definitely fix the rating.

Under favorable conditions results are obtained under the velocity-area methods which have a limiting error of five per cent or less. When conditions are poor the possibility of error may reach as high as 20 or 25 per cent. This method is explained in detail in the water supply reports of the U. S. Geological Survey.

Slope Measurements.

The flow in an open channel, where the longitudinal slopes of the bottom and water surfaces, the dimensions of the channel and the condition of roughness, vegetation, etc., of the channel are known, can also be obtained by using one of several formulas, the most popular of which is that derived by Kutter and Ganguillet, commonly known as Kutter's formula. These formulas, which may be obtained from any hydraulic text book, are used exclusively in designing canals and ditches, and have been transformed into handy diagrams and tables from which results may be obtained without the necessity of working out the formula.

Weirs.

Unquestionably a weir properly constructed and of a type for which accurate coefficients have been determined, is one of the most convenient and reliable means of measuring water in ditches and small streams. In practice, however, weirs rarely conform to the requirements imposed by the experimenters who derived the coefficient. This is especially true in Hawaii, and observations made on various types of weirs in Hawaii show that many weirs are not giving accurate results and that the erroneous rec-

ords of these weirs have been used for years in determining large payments of money for water delivered.

There are two general types of weirs—sharp-crested and broad-crested.

The sharp-crested weirs are separated into three classes, the most popular of which is the rectangular sharp-crested weir with end contractions. The formula (Francis') is simple and well known, and sufficient experimental work has been done on this type to develop satisfactory coefficients for velocities of approach, high heads over the weir crests, etc. If the crest of the weir is sharp, straight and clean and sufficiently high above the bottom of the approach channel and the end contractions complete—and if the head on the crest is measured well back from the curve over the crest—the Francis formula will give excellent results.

The rectangular sharp-crested weir without end contractions, called a suppressed weir, also gives excellent results.

The third class of sharp-crested weir is called the Cippoletti, or trapezoidal, weir after its inventor. This weir is a sharp-crested weir with end contractions which are not vertical, but slope back from the end of the crest on a batter of about one-fourth horizontally to one vertically. This slope has the effect of simplifying the formula by doing away with the correction for end contractions. (See pages 165-166, Merriman's Hydraulics.)

Broad-crested Weirs.

Broad-crested weirs are rarely constructed solely for measurement purposes. It has been found that this type of weir when already existing as a diversion structure or for some other purpose may be utilized to measure water. A series of measurements by some other method is usually necessary to determine the formula to be used. The width and shape of the crest determine the coefficient to be used. Sufficient experiments have been made to determine within fairly accurate limits, formulas for various types and shapes of crests, but usually a careful investigation by an engineer is needed to determine the formula used in any specific case.

Venturi Flumes.

The use of the basic principles of the Venturi meter for open channel discharge measurements has recently been tested by the U. S. Reclamation Service and the Department of Agriculture, and experiments thus far completed seem to indicate that the "Venturi flume," as the device has been named, will prove successful. As a substitute for ditch weirs where lack of fall, sediment carrying water, etc., make weirs impracticable, this type of measuring device promises excellent results. It is described in a reprint from the *Journal of Agriculture Research* by Mr. V. M. Cone, under date of March 13, 1916.

SUMMARY.

The various devices are generally best used under the following conditions:

Venturi Meters. For pipes of 6 inches or more in diameter.

Service Water Meters. For small pipes under ordinary service.

Pressure Gages. For special cases where other standardized meters cannot be used.

Velocity-Area Method. In streams, tunnels, ditches, or other open channels where sufficient drop to install a weir cannot be spared; where the increased cost of a weir does not justify the increased cost of construction; where the channel carries so much sediment or debris that the approach channel would be filled and the weir crest fouled and when the velocity is too great for established weir formulas.

Weirs. Where sufficient head room or drop can be spared; where the increased accuracy obtained will justify the increased expenditure; where there is not sufficient sediment or debris to foul the stations and where the entrance velocity can be slowed sufficiently to allow the use of standard formulas.

Venturi Flumes. These have been devised to increase all of the above-mentioned objections to weirs, except the cost thereof. It is claimed that this device will accurately measure dirty or foul water, at high velocities, and with small loss of head.

Swine Plague and Its Treatment

Swine plague is a specific infectious disease, characterized by catarrhal and necrotic pneumonia, in which pleurisy may or may not occur.

It usually assumes a chronic form, but may be acute, in which case the animals die, after a few hours' illness from atypical septicemia. This disease is quite widespread, but not so fatal nor as widespread as cholera. It is a sporadic or enzootic disease and rarely assumes the epizootic form.

Swine plague is caused by the bacillus suisepticus, an organism belonging to the hemorrhagic septicemia group. Artificial infection of fowls, rabbits and guinea pigs causes a rapid and fatal septicemia. Intravenous injections usually kill a rabbit in from eight to sixteen hours.

The virulence of this organism is quite variable. It may be found in respiratory organs of healthy hogs. It occurs in soil, and feces of hogs, especially those that are affected with swine plague.

It has been quite conclusively demonstrated that some predisposing condition must exist in swine before the virulence becomes sufficiently exalted to produce the disease. In some cases the organism appears to assume a virulent form outside of the animal body. There has been no satisfactory explanation of the latter condition.

In the very acute form the lesions are typical of septicemia with petechial hemorrhages in the skin, serous and mucous membranes. There may also be enlargement of the spleen and lymph

glands. The usual form, however, is chronic in nature and characterized by catarrhal pneumonia in which the lungs show areas in different stages of progress of the disease. All stages of pneumonia may be seen with areas of necrosis. These necrotic centers may be liquid or caseous and may be small or large, sometimes involving centers of several cubic inches. There is usually a fibrinous pleurisy with or without adhesions. The lungs have a mottled appearance and the bronchial and mediastinal lymph gland may be hemorrhagic or necrotic.

Swine plague is frequently confused with cholera and often veterinarians fail to get good results from the use of anti hog cholera serum because they have not correctly interpreted the symptoms and lesions seen in animals suffering from swine plague. It has been demonstrated that cholera serum has no effect upon the animals infested with the B. Suisepticus. Frequently cholera and swine plague exist in the same animal or herd, and in most of these cases the use of serum does little good. The symptoms of swine plague occurring in the chronic form are those of pneumonia with a short, dry, spasmodic cough. Dyspnoea is usually well marked, especially if the animal is forced to run a short distance. Thumping or spasmodic abdominal respiration is characteristic of the cases. The temperature is about 104° F., appetite poor, quite rapid emaciation until the animal dies from exhaustion in from 30 to 50 days.

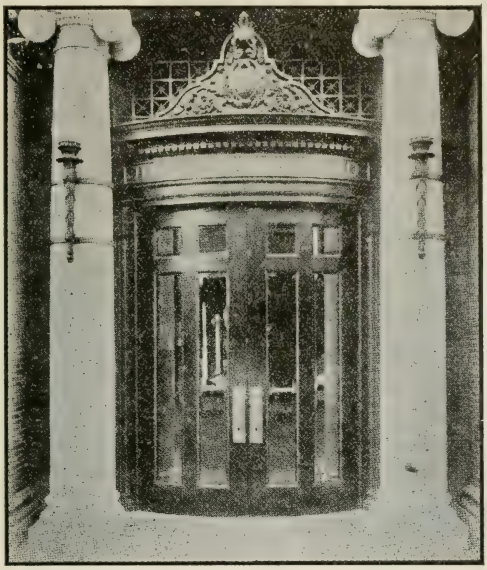
The diagnosis is a very important factor in successfully handling hogs affected by this disease.

In the treatment of swine plague a new field has opened. Cholera serum has no effect either as an immunizing or curative agent.

Hemorrhagic septicemia vaccine for swine is giving good results in herds where swine plague occurs uncomplicated with cholera. If there is cholera, serum should be given; if there is swine plague, vaccine should be given; if the two diseases occur together, both serum and vaccine should be given. Hogs may be immunized against swine plague by the injection of one or two doses of hemorrhagic septicemia vaccine for swine, and cases where the destruction of lung tissue is not too extensive may be cured by three or four injections.

Swine plague vaccine is prepared according to an original formula perfected several years ago. The basis for this formula is taken from the vaccine used by the B. A. I. in combating hemorrhagic septicemia in buffalo, in Yellowstone National Park. The formula was prepared after the examination of many lung specimens to determine the variety of organisms usually accompanying the B. Suisepticus. Hemorrhagic septicemia vaccine for swine is a polyvalent or mixed vaccine based upon the association of pathogenic organisms most frequently found in swine plague.

The above note is quoted from a trade journal issued by the Jensen Salsbery Laboratories in Kansas City, which have been furnishing the division of animal industry with samples for experimental purposes.—Editor.



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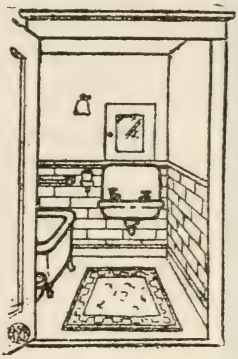
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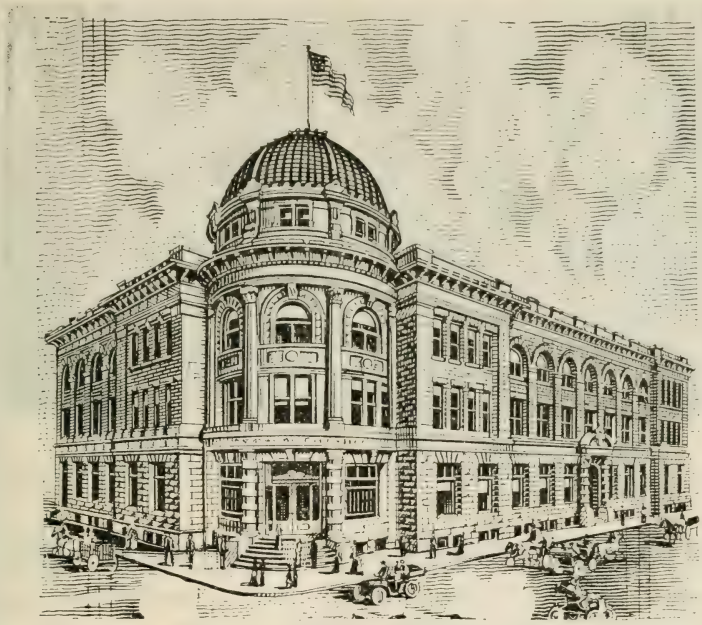
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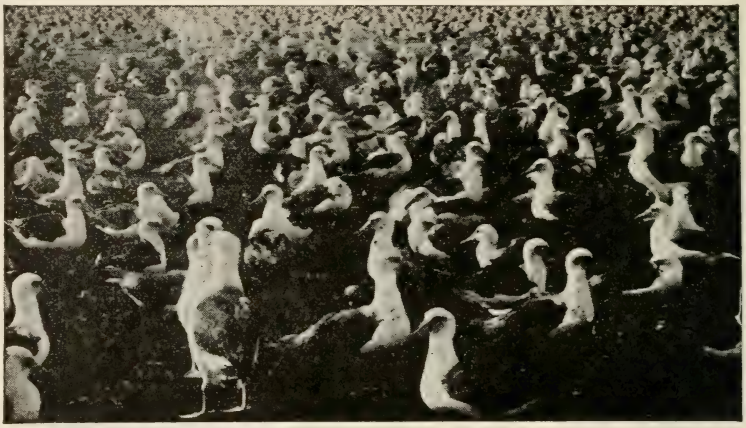
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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, JANUARY, 1917. NO. 1

SANDALWOOD BULLETIN

"The Sandalwoods of Hawaii," Botanical Bulletin No. 3 of the Division of Forestry by Mr. Joseph F. Rock, Consulting Botanist, came off the press at the end of last month and has been distributed by mail. In this bulletin, Mr. Rock has described his revision of the genus Santalum into nine species and two varieties and has given a brief history of the utilization of this romantic and now rather rare tree family. It may be news to some that a shrub form of this tree, Santalum littorale, may still be found on the slopes below the road just beyond the Diamond Head lighthouse.

A copy of this bulletin will be mailed, on request, to those who have not already received it.

The appearance, with serious consequences, of a pineapple weevil in Jamaica, described in this issue, emphasizes the importance of a very rigid inspection of all plant introductions in this Territory, and of providing the very best facilities for such inspection on the waterfront.

The forest rangers from the eighteen national forests in California, in conference lately in Berkeley, were addressed by Chas. F. Stern, state highway commissioner, on the subject of coöperation by the state and federal governments in the building of roads. Commissioner Stern dwelt upon the fact that the funds provided by the federal government for road construction in California will be spent largely in coöperation with the state road commission. When Hawaii receives its share of federal aid for roads, as it probably will when its claims therefor are properly laid before the federal government, the territorial bureau of forestry will be able to render valuable coöperation with whatever officials have the execution of the work in charge.

JUL 25 1918

Division of Forestry

Honolulu, January 16, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of December, 1916:

KAUAI TRIP.

From December 12 to 16, I was on the Island of Kauai with Land Commissioner Rivenburgh and Superintendent of Hydrography Larrison making, in conjunction with the Chamber of Commerce of Kauai, an examination of government forest reserve lands in the region of the head of Waimea canyon, looking particularly for suitable summer camp sites. I found the climate, scenery and charm of the region more delightful than ever and also a variety of situations which will offer, when the land reverts to the Territory, at the expiration of the present leases, suitable camping places for those who desire to put in more or less permanent camps with the idea of returning each summer, for those who merely wish to camp for a week or so in tents, and for those who are interested only in the scenery of the canyon and care to spend not more than one night. By lease expiration some of the land will revert to the government on December 27 of this year and the rest not until June 1, 1920. Before then a plan for the issuing of camping permits in a systematic manner, and for their administration on the ground by a forest ranger will be worked out. It is proposed also to add more land to the present reserve in this region so as to include the extensive forest and more camp sites in the region of Puukapele on the edge of Waimea canyon.

On this same trip a visit was made to Kukuiolono park and the Papapaholahola Spring Reserve where Mr. Walter D. McBryde has done extensive tree planting with very successful and pleasing results.

FOREST PLANTING.

The four men have continued tree planting under my personal supervision on the Manoa Ranger Station, Oahu, and have to date set out by various spacing over 50 different kinds of mostly timber trees in various quantities. These have been accurately marked with redwood posts and labeled so that there will be no possibility of losing their identity.

On the Kealia Forest Reserve, Kauai, Ranger Kaina D. Lovell has continued tree planting on the Kamalomalo flats and to date

has planted out a total of 9279 trees consisting of silk oak, swamp mahogany, lemongum and Japanese cedar.

This recent planting on government forest reserve lands is in addition to that which has been done in Makiki on the Honolulu Watershed Forest Reserve for the past three years, and it is planned to extend it to various forest reserves as opportunity and means are presented.

Postal reply cards were sent out at the end of the month to all tree planters in the Territory in order to ascertain for the annual report the number and kinds of trees planted during the year 1916 on private lands throughout the islands.

SANDALWOOD BULLETIN.

Botanical Bulletin No. 3 of this Division, "The Sandalwoods of Hawaii," by Mr. Joseph F. Rock, Consulting Botanist, came off the press on December 28, 1916, and has been mailed out to those whom it will interest and to public libraries.

MAKIKI SQUATTERS.

The free permits to the native Hawaiians granting them the privilege to reside in lower Makiki Valley in the Honolulu Watershed Forest Reserve were renewed for the year 1917.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, December 30, 1916.

Superintendent of Forestry, Honolulu.

DEAR SIR:—I herewith submit a report of the principal work done during the month of December, 1916:

NURSERY.

Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold		280	280
Gratis	450	740	1190
	450	1020	1470

Collections.—Government Realizations.

Collections on account of plants sold amount to	$ 5.80
Rent of office building, Nursery grounds, for October	35.00
1 Mexican saddle	35.00
Total	$75.80

PRESERVATION FOREST RESERVES.

Rent of premises at Half-way House, Tantalus, for October, November and December	$30.00
For use of land and gathering ti leaf, Kalawahine, Pauoa Valley, October, November, December	12.50
Rent of small piece of land, Pauoa Valley, 3 months	.75
Nine loads of black sand from Makiki Valley	2.25
Total	$45.50

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants under this heading amounts to 7000 in seed boxes and 600 in transplant boxes. Owing to bad weather our distribution for December has been delayed. We will complete all our large orders during the latter part of January and first part of February. We have 150,000 about ready to ship.

MAKIKI STATION.

Owing to the great demand for trees during the past two or three months our stock at this station has been considerably reduced. Our efforts are now directed toward the building up of a large stock again.

The machinery for the short log saw mill arrived a few weeks ago. We will be ready to start cutting up logs when the Honolulu Iron Works has completed the installing. We have started work on the additions to the buildings, and the space in front is being enlarged by cutting away the bank and leveling.

HONOLULU WATERSHED.

The lower end of Hering Valley is now ready for planting. Most of the upper part of this valley is planted and the trees are doing very well. Arrangements are also being made for the planting of a piece of land above the planted forest on the Kalawahine tract. We have a large number of koa and other trees ready for this work and planting will commence during the month of January.

ADVICE AND ASSISTANCE.

At the request of people residing in and around the city the writer has given advice and assistance as follows: Calls made, 6; advice by telephone, 9; advice by letter, 5; people calling at Nursery for advice, 12. Total, 32.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, Dec. 31, 1916.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of December, 1916, as follows:

During the month there arrived at the port of Honolulu 47 vessels, of which 22 carried vegetable matter and one, sailing vessel, sand. Of these vessels, six passed by the way of the Panama Canal in transit to the Orient.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1346	23,144
Fumigated	9	14
Burned	44	45
Total	1399	23,203

Of these shipments, 22,912 packages arrived as freight, 161 packages as baggage of passengers and immigrants, and 130 packages as mail matter.

RICE AND BEAN SHIPMENTS.

During the month 13,249 bags of rice and 2286 bags of beans arrived from Oriental ports and after careful inspection were passed as free from pests.

PESTS INTERCEPTED.

Approximately 3561 pieces of baggage belonging to passengers and immigrants from foreign countries were examined, and 21 packages of fruit and 21 packages of vegetables were seized and destroyed by burning.

On December 4 a passenger brought a pine tree infested with aphis (Chermes species), which was fumigated before delivery.

On December 5 two packages of seeds arrived by mail from Argentina for the Forester and were fumigated as a precaution before delivery.

On the same day a package of acorns was brought by a passenger from California. Some of the seeds had beetle grubs in them and one acorn had the larva of a moth. All were fumigated and the infested acorns were destroyed.

On December 7 a package of tree seeds arrived from Manila by mail for the Forester and was fumigated before delivery.

A case of yams packed in rice chaff was found in the baggage of an immigrant from Japan. A nest of ants (*prenolepis longicornis*) was found in the packing material, and box and contents were fumigated with carbon bisulphide for 48 hours; when again examined all ants were dead.

A passenger brought a bunch of bananas from Fiji December 8 on the S. S. Niagara which was seized and returned on board.

On the same steamer a passenger brought a hydrangea plant from Sydney which was fumigated and the soil removed before delivery.

On December 10 five packages of coffee seed came by mail from Java for the Hawaii Experiment Station. The seed was removed from the packing, and treated in a 4% solution of formalin; the packing was destroyed. The young plants will be in quarantine for six months.

December 18 a passenger brought a five-needle pine tree in his baggage, also an infested maple tree. Both were destroyed by burning, the pine tree being contraband under ruling of the Federal Horticultural Board, Washington, D. C.

One ornamental plant with the same steamer was fumigated and the soil removed before delivery.

On December 19 the crew of the S. S. Ventura tried to land some alligator pears from Samoa. These were seized and destroyed.

Several palms in a shipment of plants from California on December 25 had to be fumigated on account of mealy bug infestation.

On December 7 two cases of beneficial insects arrived on the S. S. Persia Maru for Hawaiian Sugar Planters' Association experiment station. These were opened in my presence by Mr. Swezey and all material and waste has been destroyed after the parasites were secured.

HILO INSPECTION.

Brother M. Newell of Hilo reports the arrival of five steamers, four of which brought vegetable matter, consisting of 270 lots and 5322 packages of fruits and vegetables. On December 11 the S. S. Seiyu Maru arrived direct from Japan, bringing 6215 bags of rice, 209 bags of beans, 20 bags of peanuts, 10 bags of millet and 2 boxes of yams. All of the above shipments were free from pests.

INTER-ISLAND INSPECTION.

Sixty-two steamers plying between the port of Honolulu and other islands were attended to during the month. The following shipments were passed as free from pests:

Taro	614	packages
Plants	171	packages
Vegetables	89	packages
Fruit	21	packages
Total passed	895	packages

The following packages were refused shipment, as they did not meet with the regulations pertaining to soil and infestations:

Plants	16	packages
Fruit	11	packages
Total refused	27	packages

Respectfully submitted,

E. M. EHRHORN,
Chief of Division of Plant Inspection.

Division of Entomology

Honolulu, Jan. 15, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—During the month of December the insectary handled 57,600 pupae of the melon fly, from which there were bred 1900 females and 1558 males of *Opius fletcheri*. The parasites were distributed as follows:

	Females.	Males.
Oahu:		
Sheridan Street	600	560
Kalakaua Avenue	715	540
Moanalua	675	605
Total	1990	1705

The corn leaf-hopper parasites have been put mostly at the U. S. Experiment Station (December 19, 35; December 20, 50), and have now become established there.

Very respectfully,

D. T. FULLAWAY,
Entomologist.

Division of Animal Industry

Honolulu, Jan. 23, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I beg to submit herewith my report on the work of the Division of Animal Industry for the month of December, 1916:

BOVINE TUBERCULOSIS CONTROL.

The final result of the year's work shows that 5151 dairy animals were tested, of which number 148 head, or 2.87 per cent, were found to be affected with tuberculosis. All these animals were removed from the dairies and the greater majority destroyed under the direct supervision of this office.

As compared to the previous year, 1915, when the percentage of reactors was 3.08, the decrease in prevalence is noticeable and would undoubtedly have been much more so had this year's test included the more than 2000 head cattle belonging to the railway ranches which last year showed but a small fraction of one per cent of reactors.

On the Island of Hawaii 1836 head were tested, with 44 reactors, or 2.39 per cent. The final figures from Maui and Kauai have not yet come to hand.

IMPORTATION OF LIVE STOCK.

During 1916 the importations of live stock have fallen far below those of 1915. The number of swine, for instance, fell from 2042 to only 53 head, while mules fell from 567 to 432. Poultry importations only increased decidedly, from 1142 crates in 1915 to over 1800 during this year; and still it is believed that the Territory produced far more poultry during 1916 than was ever the case before, as rational poultry raising on a large scale has begun to develop on at least three of the principal islands.

DISEASES OF LIVE STOCK.

No outbreaks were reported during December. So far as the past year is concerned, the record is unprecedented in so far as absence of infectious and contagious diseases is concerned. Diseases of hogs especially have decreased, though influenza and spinal meningitis in horses and mules also have occurred less frequently than hitherto.

The subjects above referred to are fully discussed in the 1915-1916 report, the preparation of which has been in progress during the month and will be ready for the printer as soon as all the deputies are heard from.

QUARANTINE STATION.

In Honolulu as well as in Hilo the quarantine stations have repeatedly been almost totally inundated by the heavy rains, but although many animals happened to be at both stations no losses directly due to this condition occurred.

It has, however, been impossible to begin the work on the new dog kennels, and it will undoubtedly be wise not to attempt it until the weather moderates definitely.

Respectfully submitted,

VICTOR A. NÖRGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, January 5, 1917.

Dr. V. A. Nörgaard,
Chief of Division of Animal Industry,
Bureau of Agriculture and Forestry,
Honolulu, T. H.

SIRS—I beg to submit the following report for the month of December:

TUBERCULOSIS CONTROL:

The following dairy cattle were tested during the month:

	T.	P.	C.
M. Cabral	1	1	0
F. de Mello	16	15	1
S. Saito	10	10	0
T. Okomoto	9	9	0
A. M. McKeever	2	2	0
J. A. Castro	1	1	0
S. Mendonca	1	1	0
A. Ornellas	2	2	0

	T.	P.	C.
P. A. Ornellas	4	4	0
J. Rodriques	3	3	0
J. Nascimento	3	3	0
C. A. Vasconcellas	1	1	0
J. Santiago	2	2	0
M. Diaz	6	6	0
J. K. Gomes	1	1	0
O. R. & L. Co.	4	4	0
J. Moniz	1	1	0
J. A. Templeton	84	83	1
Carson Toat	43	42	1
J. F. Borris	18	18	0
Y. Ogawa	7	7	0
F. S. Lyman	45	45	0
Industrial School, Waialee	42	42	0

From the above list it will be seen that a total of 306 head of dairy cattle were tested out of which number 303 were passed and tagged and three condemned and branded.

IMPORTATIONS OF LIVE STOCK.

S. S. Matsonia, San Francisco: 2 dogs, H. K. Castle; 1 dog, Mrs. L. Andrews; 1 dog, R. W. Shingle; 1 dog, W. F. X. Co.

S. S. China, Orient: 1 monkey, 2 doves, 3 canaries, Mr. Bowman.

S. S. Lurline, San Francisco: 1 pony, H. K. Castle; 2 horses, Lieut. Lutebrant; 3 horses, Gen. Treat; 5 thoroughbred mares, 1 thoroughbred colt, 1 percheron stallion, 5 pure bred Kentucky jacks, Parker Ranch; 19 pure bred Ayreshire cows, 4 pure bred Ayreshire calves, W. H. Rice, Kauai; 1 pure bred Ayreshire bull, 3 pure bred Hampshire hogs, H. Hackfeld & Co.; 14 hogs, J. A. Bortfeld; 41 cts. poultry; 2 pure bred Hereford bulls, Harold Rice, Maui.

S. S. Wilhelmina, San Francisco: 1 dog, Mrs. E. D. Tenney; 65 cts. poultry.

S. S. Great Northern, San Francisco: 2 dogs, Mrs. C. Stansfield.

S. S. Manoa, San Francisco: 104 cts. poultry, various; 1 ct. poultry, D. H. Case, Maui; 1 ct. hogs, Maui Agricultural Company.

S. S. Niagara, Vancouver: 8 monkeys, 1 bear, 2 geese, J. H. Wise; 2 pheasants, B. Hollinger.

S. S. China, San Francisco: 1 dog, Mrs. H. B. Giffard.

Respectfully submitted,

L. N. Case,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, January 4, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

GENTLEMEN:—The following report of operations of the Division of Hydrography during December, 1916, is submitted:

WEATHER CONDITIONS.

The month of December was marked by general wet weather over all islands, and a heavy storm on Kauai on December 18 which caused much damage to ditches, power plants, etc., and the loss of one life. From 11 a. m. December 18 to 11 a. m. December 19, the rainfall at Wainiha, Kauai, exceeded 25 inches. Sharp floods also occurred on Oahu on December 8 and 27, which were of short duration.

SPECIAL REPORTS.

A considerable part of the time of G. K. Larrison and E. E. Goo, and all of the time of R. C. Rice, R. D. Klise and C. T. Bailey was spent in preparing the report of the Territorial Water Commission which is to be submitted to the Governor of Hawaii in January. All except G. K. Larrison were paid from the Water Commission appropriation for the time expended on this work.

A paper pertaining to the administration, coöperation, personnel, field work, office work, relations to the public, and relations to the Washington office of the U. S. Geological Survey was prepared. This paper is to be presented at the annual conference of district engineers to be held January 15 to 20, 1917, at Denver, Colorado. A copy is attached hereto.

SPECIAL WORK.

G. K. Larrison spent December 12-16 on Kauai with the Superintendent of Forestry and the Commissioner of Public Lands, all of whom acted with other members of the Kauai Chamber of Commerce, as a special committee to investigate and report to the Kauai Chamber of Commerce, conditions relative to the proposed Waimea Canyon Park or camping place.

OPERATION AND MAINTENANCE WORK.

Kauai. Twenty-four stream and ditch measurement stations and eight rainfall measurement stations were visited. Thirty stream and ditch discharge measurements were made.

A heavy fence was constructed around the temperature measurement station recently established at Kokee. This instrument registered a minimum of 41 degrees F. on the morning of December 15.

A heavy rain storm accompanied by lightning and thunder visited the Island of Kauai on December 18. The water-stage recorder on the Hanapepe river was washed away and has not been recovered. The two foot-suspension bridges on the two branches of the Wainiha river in the lower valley were also destroyed.

Oahu. Fourteen stream and 13 rainfall measurement stations were visited and 7 stream measurements were made.

Blue print data pertaining to the flow of the North and South Forks of the Kaukonahua stream were furnished the U. S. Army and the Wahiawa Water Co., Ltd.

Maui. The first four days of the month were spent by G. K. Larrison in showing and dismantling the hydrographic exhibit at the Maui County Fair. One stream measurement station was visited.

H. A. R. Austin visited 18 stream and one rainfall measurement stations, made 18 discharge measurements and repaired and cleared about two miles of trail.

Hawaii. H. A. R. Austin spent three days collecting data and information relative to the Kohala and Kehena ditches.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

A New Pineapple Pest of the West Indies

In the Journal of the Jamaica Agricultural Society, Vol. XX, No. 8, August, 1916, and Vol. XX, No. 9, September, 1916, notice is given of the appearance of a very serious pineapple pest, a weevil, which destroyed practically 75 per cent of the crop during the year preceding July 21, 1916. It attacks both plants and fruit.

The following is a copy of the articles above referred to:

PINEAPPLES.

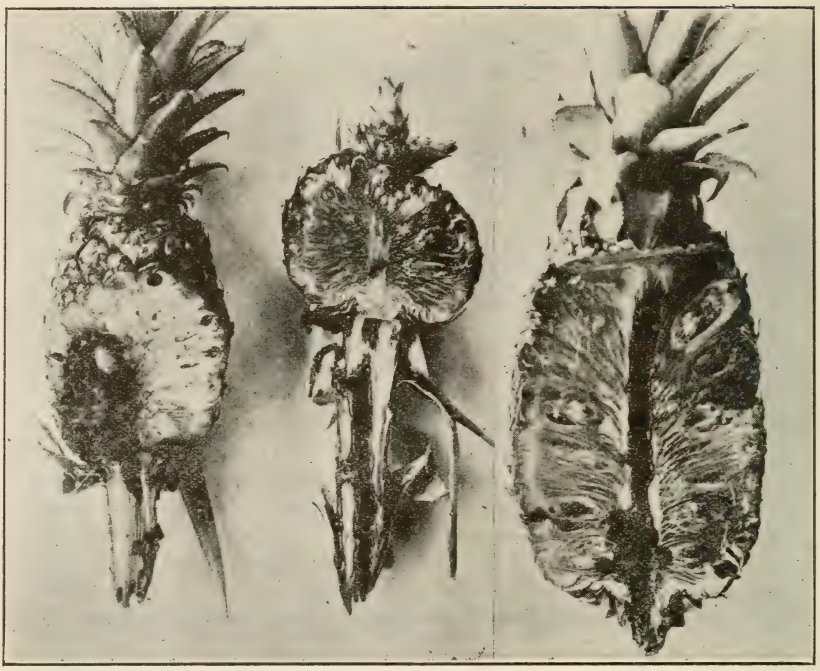
New Weevil Injury in Above Rocks District.

The Above Rocks Branch Agricultural Society recently raised the subject of grubs attacking pineapples and the instructor, Mr. A. P. Hanson, brought the matter to the attention of the entomologist, Mr. A. H. Ritchie. These gentlemen paid a visit to the district on Friday, the 21st of July, and as a result of their investigations have unearthed another black weevil. It will be recalled that Messrs. Ritchie and Hanson were the principal figures in the black weevil of banana question in the initial stages last November. Black weevils would appear to be their specialty.

From the reports by the entomologist and the instructor on this visit now before us and from which we cull the following details, the weevil of pineapple is of serious importance as fully 75 per cent of the crop has during the year past been lost and the growers of the district are truly alarmed. In former years, settlers reckoned to make £8 to £12 from their pines but this crop has not been worth the candle. Not only, however, does the crop suffer but the supply of slips for replanting is becoming limited.

The weevil is large and black, about three times the size of the banana weevil and of the same general build. The grub resembles the grub of the brown weevil to be found in decaying banana stumps, being legless (as all weevil grubs), yellowish white, and with the peculiar swelling or bump on the posterior third of the body, but growing to much greater proportions.

So far the entomologist has been unable to get any evidence of this attack being formerly known to well-known pine growers. The growers in Above Rocks say they first noticed the trouble three to four years ago and that it has been growing worse each succeeding year. The question has now been raised for the first time, however. The plants, it is stated, are in otherwise splendid health. The attack is worst on the ratoon crop and



Pineapple borer from Jamaica, showing larva and damage to fruit.

some contend is confined to the ratoon crop—the plant pines not being attacked; this point, the entomologist remarks, must be looked into. The exact nature of the injury to the pineapple—fruit and plant—may be best gathered from the following extract from the report of the entomologist:

1. *Attack Upon Fruit.*

a. Upon the pineapple just developing, initial attack is indicated by exudation of pinkish jelly which coagulated in beads or groups of beads.

b. The opening of the burrows of the grub may be indicated by the voidance of pine frass of a yellow color.

c. The attack may be at any point of the fruit, from the collar of the crown down to the junction of fruit and stalk; the latter or the region of the latter is very common.

d. The fruit before it is shot from the "cabbage" may be attacked and hence never develop. The grub descends and the heart becomes filled with a jelly containing much pine frass. The condition might be called "dead-heart."

e. The fruit may be attacked just after being shot and the decaying brown shell of the fruit is all that remains. Such

frass, jelly, and decaying tissue is frequented by various scavengers, snails, beetles, flies, etc.

2. *Attack Upon Plants.*

a. Examples coming to my notice show entrance to the plant:

(1) By way of the fruit stalk, the channel leading from the decaying fruit, first attacked, down into the pine proper.

(2) At the base of a leaf; the younger grubs would appear to bore through the base of one or two leaves as indicated by tiny holes, but for the voidance of frass the grub later makes a bigger opening to the exterior and these openings, on the leaves being stripped, are most conspicuous. The accumulation of frass and jelly down among the leaves is a clear indication of attack.

(3) The plant may be entered before the fruit is formed and a "dead-heart" condition results.

(4) Once entered, the grub proceeds to tunnel out the entire plant and root system with the result that the plant is destroyed and dries out. The production of satisfactory "Slips" for replanting is impossible by such weakened stock.

(5) An egg was found by an entomologist neatly deposited in the fruit stalk, an inch and a half below junction of fruit and stalk.

General Health of Plants.—The health of the plants is excellent; the so-called pineapple "blight" so common on the Liguanea plain, is nowhere to be seen in the section visited and the pines are normally large and strong.

Variety of Pine Cultivated.—The variety grown principally is known as "Cheese Pine." "Sugar Loaf" is also grown. The fruit produced is of excellent flavor and texture. The price paid to growers by market women range to as high as 3s. 6d. per dozen for extra choice fruits.

Previous History.—There is a concensus of opinion that the trouble was noticed for the first time upon pines three to four years ago. From the time it was first noticed, the succeeding crops have been attacked in increasing degree and this crop has suffered most of all. The settlers are gravely concerned over the matter.

I have already shown material to Mr. Cradwick who was in town for the half yearly meeting of the J. A. S. He had never personally seen pines attacked in the manner nor heard of such injury.

Mr. John Barclay, Secretary, J. A. S., has no record of complaint of pines being attacked by weevil grubs.

Hon. Philip Cork who has had considerable experience with pine cultivation on Liguanea Plain, in answer to a communica-

tion on the subject, addressed him by the entomologist, states that he has no record of such insect attack as that described.

Mr. William Harris, Superintendent of Public Gardens, also stated on inquiry by the entomologist, that he had never had complaint of such insect attack nor personally seen it.

The weevil has been forwarded to specialists for scientific determination. Further investigations are proceeding and future reports on this new insect foe of pineapples are awaited with interest. (The Journal of the Jamaica Agricultural Society, Vol XX, No. 8, August, 1916, pages 316, 317, 318.)

During the past month, the entomologist has been in coöperation with Messrs. Hanson, Schleifer and Somerville, (agricultural instructors) on important work, and has made reports to the Director of Agriculture. From reports to us and the instructors, we cull the following details:

Pineapple Weevil In Above Rocks.—A second visit was paid to the district where pineapples have been badly attacked by a new black weevil. The following points are noteworthy: (a) In the previous report it was stated that some of the cultivators were of the opinion that plant or first year pines were not attacked but the entomologist now says this idea has no foundation in fact, as they too are attacked just as severely in cases. (b) The entomologist is of opinion that the belief of cultivators that certain varieties are immune to attack is not likely to prove true when all varieties are equally planted and the weevil has equal opportunity of all. (c) After stating that at the present time (August) the adult weevils are very few in number indeed, the first recommendations made is as follows: "There should be an extensive grubbing out of the affected pines. These should be split open with the cutlass so that the grubs will be exposed to weather and natural enemies—there are usually fowls, turkeys, hogs, lizards, frogs, etc., everywhere about the cultivations. The plants so treated will readily dry out and complete development of the immature stages will thereby be rendered impossible. The grubs are capable only of limited locomotion and are quite unable to search out another standing pine. In an attacked pine, there will be from two or three to five weevil grubs. If grubbed out now the development of as many weevils will have been prevented—these weevils be it noted would later take wing to clean or unattacked cultivations and produce the eggs for a succeeding generation which is capable of doing great injury to next crop. The number of weevils (adults) on the plants at the present time is pretty well negligible. With general coöperation in this work, much could be effected for the saving of next crop. Clean up.

The entomologist also advises an experimental pinery at Hope for a full study of the weevil so that other control measures may be devised. Mr. H. Q. Levy has informed Mr. Ritchie that in his long experience with pineapples in Jamaica he has had no experience with such weevil: Mealy bug was his only insect

foe.—(The Journal of The Jamaica Agricultural Society, Vol. XX, No. 9, September, 1916, pages 361 and 362.)

Since the opening of the Panama Canal all steamers by that route calling here in transit for coal or provisions have been inspected. The appearance of this pineapple pest in the West Indies emphasizes the necessity of further strengthening our Division of Plant Inspection, for should this pest ever gain a foothold here our pineapple industry would get a severe setback.

A rapid method of kiln-drying eastern hemlock has been developed at the forest products laboratory at Madison, Wisconsin, whereby shiplap can be dried green from the saw to shipping weight in forty-eight hours. By this method two-inch plank can be dried to shipping weight in six to eight days.

It is estimated that four-fifths of the water available for irrigation and domestic use in the State of Oregon comes from the timber clad slopes of the national forests. .

Fires burned twenty-five million board feet of timber on the National forests of Oregon, Washington and Alaska in 1916. The forest service fought 1176 fires in this region during the year at an expense of $19,000.

The plantings of the Oriental timber bamboo in northern Florida and Louisiana have grown to a height of 25 feet, and there is no longer any question about their producing in the United States good canes comparable to those which they produce in China and Japan. A quick method of their propagation has been worked out so that it will be now possible to supply large enough quantities of the young plants to set out many small areas throughout the South, from the Carolinas to California, wherever there is sufficient moisture and the land is not too high priced to admit of their cultivation.

Public Forests for Recreation

That over a million and a half of people use the national forests as playgrounds each year was the statement made by Henry S. Graves, chief of the forest service, before the American Forestry Association in Washington this month. "Located as they are," said Mr. Graves, "the National Forests comprise many regions of superb scenery and unexcelled recreation attraction. In a very real sense these attractions of the forests constitute a natural resource that must be safeguarded, utilized and developed."

Mr. Graves stated that a quarter of a century had passed since the establishment of the first national forests by a law which marked the beginning of a new and more enlightened method of public land administration. The nineteenth century land system, he said, was one wholly of land distribution, which was successful as applied to agricultural lands, but unsuccessful as applied to non-agricultural lands chiefly valuable for growing timber. The keynote of the present-day policy is to secure such a disposition, use and development of the public lands as will render a maximum service to the public. "The country has recognized that public lands of chief value for forest purposes and essential to protect water resources should remain under public control," Mr. Graves continued. "The struggle is now on as to who shall own and control the public water-power sites, the coal, oil, phosphate and potassium deposits and the common grazing lands that are not suited to development by individuals under any of the homestead laws."

More and more of the larger private holdings are being posted with "No Trespassing" signs, Mr. Graves said, and are closed to the public. "The closing of private lands points to the value of publicly owned forest lands where people living in cities and hot agricultural regions can find an opportunity for the refreshment and recreation that can be secured by a sojourn in the forests."

Innumerable localities on the National Forests, which are not generally known, have a wealth of scenic beauty, Mr. Graves said. A very practical problem, he stated, is that of opening up and making these great public properties available for as wide use as possible by people of little means as well as by the wealthy. In the national forests of Colorado alone, it is said there were last summer 676,000 visitors.

"The recreation features of the National Forests are fostered in a variety of ways," Mr. Graves further remarked. "Areas of scenic value are set aside as camping sites and are withdrawn from any use which would reduce their beauty.

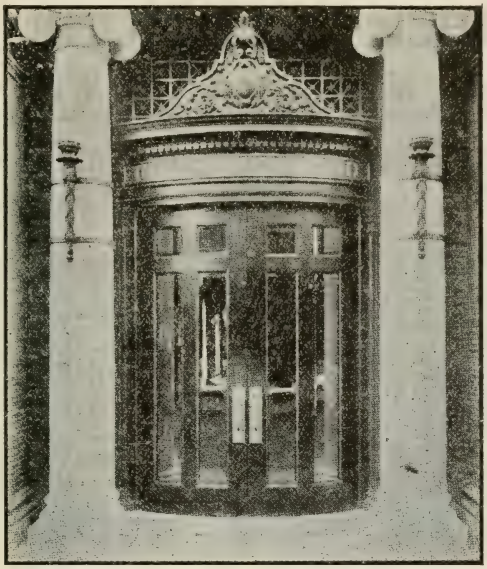
Roads and trails are built by the forest service to open up points of scenic interest, streams are stocked with fish, and sites for summer homes can be leased for long periods."

While the Hawaiian forest service has no revenues for road construction, it is not oblivious to opportunities for opening territorial forests as places of recreation. As evidence see the January report of the superintendent of forestry in this number. Action such as that being taken for making the gorgeous scenery of Waimea canyon on Kauai available as summer camping sites will no doubt in time be extended to other sublime and salubrious regions of the Territory's forested domain. This, indeed, is a movement that may be predicted to develop tourist promotion results not surpassed by those of the exploitation of any other of the many awe-inspiring, eye-delighting, health-recruiting, soul-soothing and research-inviting features that Mother Nature has liberally distributed throughout this archipelago.

Philippine Woods

From the Bureau of Forestry, Manila, has come a copy of its latest publication, being Bulletin 14, entitled, "Commercial Woods of the Philippines: Their Preparation and Uses." This is by far the most comprehensive work so far published on the subject and, from the point of view of the wood-user, also the most practical. The book consists of five parts dealing with different phases of the subject. Part I is a concise description of the forests and of lumbering conditions in the islands; Part II, a discussion in popular language of the physical and mechanical properties and the structure of wood; Part III, a very comprehensive discussion of uses, the different purposes to which wood is put being arranged in alphabetical order, with frequent cross-references; Part IV gives, also in the least possible technical form, directions for the identification of woods, and Part V, which occupies more than half of the book, gives detailed descriptions of about 360 Philippine woods, with notes on their mechanical properties and workability, their distribution in the islands, local names, uses, supply and approximate prices. There is also a general index, one of scientific names and one of all the official, commercial and local names.

This bulletin is sold by the Philippine Bureau of Forestry at $1.00 U. S. currency. Money orders should be made out to "The Director of Forestry, Manila, P. I."



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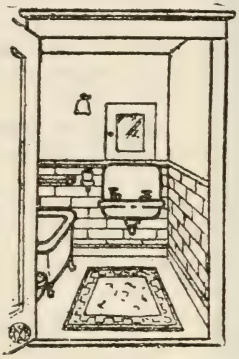
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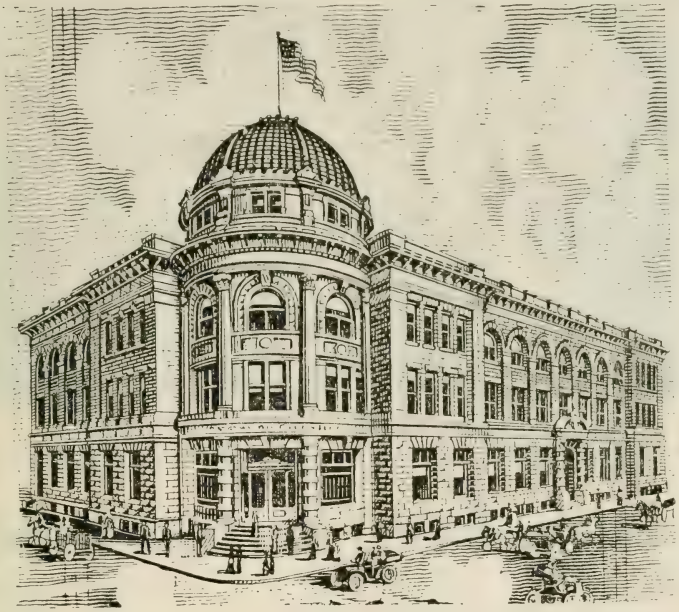
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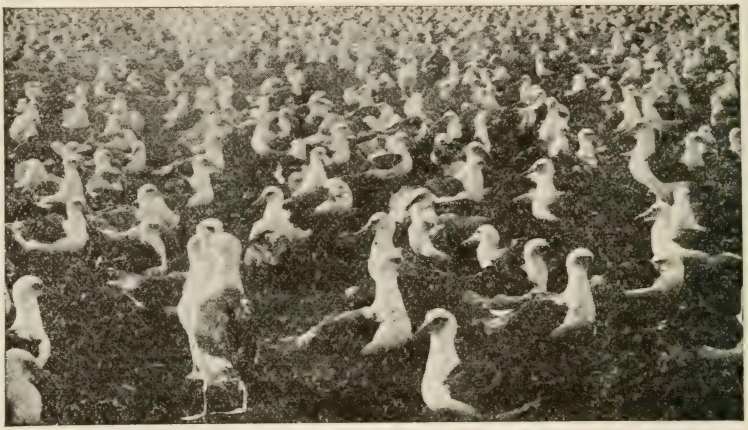
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THE HAWAIIAN FORESTER AND AGRICULTURIST

FEBRUARY, 1917

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

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The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, FEBRUARY, 1917. NO. 2

A quantity of Congressional vegetable seed has recently been received at the Government Nursery from Washington through our Delegate Hon. J. K. Kalanianaole. The seed is put up in two different ways. One package contains carrot, cucumber, lettuce, radish and turnip seed and the other contains pea, beet, lettuce, muskmelon and radish seed. These seeds will be distributed free as long as the supply lasts. Applications for them should be sent to the Forest Nurseryman, Box 207, Honolulu.

Among the recent introductions of forest tree seed made by the Division of Forestry, are seeds of the acle, narra and Benguet pine which were obtained through the kindness of Mr. A. F. Fischer, Acting Director of Forestry at Manila, P. I. These species are important timber trees of the Philippines and show promise of being of value in these islands.

The appointment, on January 1, of Mr. Will J. Cooper, as fruit and plant inspector for Maui, and of Captain George B. Leavitt on March 8 for Kauai, is another forward step taken by the Division of Entomology in the effort to keep injurious insect pests from entering our Territory.

During January Entomologist D. T. Fullaway liberated 2205 parasites on the melon fly and 6511 parasites on the corn leaf hopper. These are both beneficial insects which have recently been introduced, the first coming from India and the second from the Philippines. Both already show promise of controlling the pests which have been bothering melon and corn growers. These parasites will be supplied for liberation, as fast as available, on application to the entomologist, Box 207, Honolulu.

The agitation in Congress over the question of the eradication of bovine tuberculosis in states on the mainland, as pointed out in the January report of the territorial veterinarian, shows that the subject is now becoming of national importance. Hawaii is not far behind in the lead by having instituted years ago the campaign for the eradication of the disease which is dangerous to the public health.

Among the recent importations of live stock which should result in the improvement of the herds and flocks in the Territory may be noted 50 Merino rams from New Zealand, 15 Holstein cows and 2 Holstein bulls, 13 Southdown rams, and Duroc Jersey and Berkshire hogs.

Division of Forestry

Honolulu, February 21, 1917.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of January, 1917:

Forest Reserve Fencing.

Two days during the month were spent at Hauula, Oahu, in conference with representatives of the homesteaders in that region who have agreed to build the fence, in accordance with the understanding, to keep their stock from getting into the forest, and in flagging the line on which the fence is to be constructed.

An inspection was made of the recently constructed short stretch of new fence on part of the boundary of the Lualualei forest reserve, Oahu, and it was found to be in good condition and the forest already showing the beneficial results of the protection.

Ranger F. B. Dodge, under instructions from this office, began during the month a detailed examination of the boundaries of government lands within the Hilo forest reserve, Hawaii, to ascertain where any new fencing is needed to keep stock out of the forest.

Forest Planting.

The planting of koa on the Manoa ranger station and on other parts of upper Manoa Valley within the reserve was continued and the experimental planting of representative quantities of exotic trees, mostly having timber value, was completed at this station.

A quantity of seed of the narra and acle, two important timber trees of the Philippines, was received from the acting director of forestry at Manila and has been germinated for planting out in suitable parts of the forest reserves.

Biennial Report.

A portion of my time has been spent in compiling statistics on tree planting and fencing in conjunction with the preparation of the report of this division for the past two years.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, February 21, 1917.

The Superintendent of Forestry.

Dear Sir:—The following is a report of the principal work done during the month of January, 1917.

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	...	100	34	134
Gratis	...	400	578	978
	...	500	612	1112

Collections.

Collections on account of plants sold amounted to	$ 3.85
Rent of Office Building Nursery Grounds	35.00
Total	$38.85

Plantation Companies and Other Corporations.

The distribution of trees under this heading amounted to 110,000 in seed boxes, 1650 in transplant boxes and 450 pot grown—total 112,100. All orders are now filled with the exception of a few which we have agreed to fill at intervals during 1917.

Makiki Station.

The work at this station has been principally routine. Owing to the great demand for trees during the past several months our stock has become very much reduced. We are now busy building up our stock again.

Honolulu Watershed Planting.

A piece of land above the planted forest on Kalawahine tract was planted with koa trees during the month, 706 being used. We are now clearing off and preparing for more planting in the lower end of Hering Valley.

Advice and Assistance.

The writer has at the request of people in and around the city made calls and given advice as follows:

Calls made	6
Advice given by telephone	8
Advice given by letter	5
Advice given people calling at nursery	12
Total	31

Congressional Vegetable Seed.

We have just received from Washington, D. C., through Honorable J. K. Kalanianaole, 2904 packages of vegetable seeds consisting of the following:

V-6 1542 packages containing in each, carrot, cucumber, lettuce, radish and turnips.

V-2 1362 packages containing in each, peas, beet, lettuce, muskmelon and radish.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

NICOTINE AS AN INSECTICIDE.

(1) Nicotine spray solutions do not pass into the tracheæ, nor do they penetrate the integuments of insects.

(2) The fumes from nicotine used as a fumigant, the vapors from nicotine spray solutions, and the odoriferous particles from evaporated nicotine spray solutions or from powdered tobacco pass into the tracheæ and are widely distributed to all the tissues.

(3) Regardless of how it is applied, whenever nicotine kills insects, as well as all other animals, it kills by paralysis, which in insects travels along the ventral nerve cord from the abdomen to the brain.

(4) The writer does not know just how nicotine paralyzes the nervous system, but he does know that it prevents the nerve cells from functioning, and that in regard to the simplest animals its presence around the cells causes the same structural changes resulting in death as observed when other animals of the same kind are deprived of oxygen. In such cases it seems to kill physically rather than chemically, but the evidence presented does not conclusively prove this view.—Exchange.

Division of Plant Inspection

Honolulu, January 31, 1917.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of January, 1917, as follows:

During the month there arrived at the port of Honolulu 55 vessels of which 23 carried vegetable matter. Of these vessels 11 passed by the way of the Panama Canal in transit to the Orient.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1,254	26,768
Fumigated	2	2
Burned	115	115
Returned as contraband	7	7
Total	1,378	26,892

Of these shipments 26,537 packages arrived as freight, 238 packages as baggage of passengers and immigrants and 117 packages as mail matter.

Rice and Bean Shipments.

During the month 27,069 bags of rice and 1451 bags of beans from Japan and other Oriental ports arrived and after careful inspection were passed as free from pests.

Pests Intercepted.

Approximately 3435 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and 75 packages of fruit and 14 packages of vegetables were seized and destroyed by burning.

On January 1 three ornamental plants were ordered back on board having no federal permit. These were being brought by one of the crew for friends. On the same date a passenger brought a package of walnuts from Korea, and as these were found infested with the larvae of a moth, they were destroyed. On January 6 a miniature garden containing a 5-leaf pinetree, prohibited by the federal horticultural board, a cherry tree infested with a brown velvet lichen and other plants was destroyed by burning. On January 9 a box of grapefruit from the Isle of Pines, West Indies, via San Francisco, by Wells Fargo & Co.'s express was seized and destroyed, it being a prohibited importation. Two packages of tree seeds, one from Manila and

one from Australia for the forester, were fumigated with carbon-bisulphide as a precaution.

The following fruit, seeds and bulbs were seized in the post office and treated and returned to the shipper:

One package of chestnuts from Japan, 1 package of citrus from Japan, 1 package of bulbs from Portugal, 1 package of treeseeds from Japan, one package of merchandise from Japan containing a few sandpears, and these were removed and destroyed before the package was delivered. Another package of merchandise contained some bulbs which were seized and destroyed. Five packages of beneficial insects for the H. S. P. A. arrived during the month; four of these arrived in bad condition and were destroyed by burning. All soil accompanying the other shipment was disinfected and burned.

Hilo Inspection.

Brother M. Newell of Hilo reports the arrival of seven steamers and three sailing vessels. Four steamers brought vegetable matter consisting of 193 lots and 3293 packages of fruits and vegetables which were all found free from pest. The three sailing vessels brought lumber.

Kahului Inspection.

On January 1 Mr. Will Cooper of Wailuku, Maui, was installed as fruit inspector. On January 11 I accompanied the steamer Lurline to Kahului for the purpose of being present at the inspection of the fruit and vegetable shipments. Mr. Cooper met me at the wharf and we went over the various shipments together. The importers were very pleased that all shipments are to receive a local inspection and will coöperate with Mr. Cooper in every way. Mr. Cooper reports the arrival of two vessels during the month, bringing 14 lots and 537 packages of fruits and vegetables, all of which were found free from pests and were passed for delivery.

Inter-Island Inspection.

Seventy-one steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro, 646 bags; plants, 137 packages; vegetables, 159 packages; fruit, 16 packages; total passed, 958 packages.

The following packages were refused shipment as they did not meet with the regulations pertaining to soil and infestations:

Plants, 16 packages; fruit, 4 packages; total refused, 20 packages.

Respectfully submitted,

E. M. Ehrhorn,
Chief of Division of Plant Inspection.

Division of Entomology

Honolulu, February 28, 1917.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—During the month of January the insectary produced 1442 females and 1138 males of the *Opius fletcheri,* and the distribution of parasites was as follows:

Opius fletcheri.

	Females	*Males*
Moiliili	280	210
Moanalua	310	260
Niu	100	50
Kailua—Windward Oahu	585	410

Tetrastichus.

Nuuanu	400

Galesus Silvestrii.

Nuuanu	63

The corn leaf hopper egg parasites were distributed as follows:

Waikiki	25
H. S. P. A.	30
U. S. Experiment Station	444
Sheridan Street	900
Moiliili	2116
Board of Agriculture and Forestry	300
Makiki	500
College of Hawaii	300
Kailua—Windward Oahu	1761
C. Gay (Lanai)	135

We now have definite proof of the establishment of the melon fly parasite in Kona on the Island of Hawaii, parasites having been bred from infested wild morordicas brought in by Mr. Pemberton. The parasite has also been recovered several times in Honolulu from infested cucurbitaceous fruits.

Very respectfully,

D. T. Fullaway,
Entomologist.

Division of Animal Industry

Honolulu, February 23, 1917.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to submit herewith my report on the work of the Division of Animal Industry for the month of January, 1917.

Bovine Tuberculosis Work.

With the approaching session of the territorial legislature and possible action with regard to the work of this Division along the lines of control and eradication of bovine tuberculosis, it seems almost providential that the subject should have been considered by the federal congress at its present session.

In accordance with a correspondent to the Breeder's Gazette, Representative Linthicum of Maryland recently advocated before the House of Representatives the destruction of alll cattle having tuberculosis, the payment for them at determined rates, the pasteurization of all dairy products, and the compulsory tuberculin test of all dairy cattle. It is estimated that 10 per cent, or 2,000,000, of the dairy cattle of the country are tubercular while slaughterhouse records show 2½ per cent of the beef cattle and 9 per cent of the hogs to be similarly infected. Mr. Linthicum would further compel the sanitary handling, storing and marketing of meat and dairy products. The feasibility of the project has been demonstrated in the District of Columbia and the urgency of the situation is recognized by the Department of Agriculture as evidenced by its request of Congress for an appropriation of $75,000 for testing pure bred cattle in cooperation with the owners.

The same correspondent goes on to say that the National Grange at its meeting in Washington last November urged breeders and handlers of all classes of dairy cattle to weed out the reactors to the tuberculin test as a matter of protection to their own financial interests. The Grange believes that reasonable compensation should be allowed for all animals killed in the eradication of tuberculosis.

The above quotations show plainly that the eradication of bovine tuberculosis is fast becoming a question of national importance, and credit will undoubtedly redound upon the states, counties and communities which have taken the lead and evolved the methods upon which nation-wide efforts must necessarily be based. By the same token the relinquishment of years of effort and expense at this time might easily assume an aspect very undesirable and difficult to explain.

Dog Distemper at Quarantine Station.

The cold and wet weather during January was partly responsible for the loss of three pups and two dogs while in quarantine, though the direct cause was the introduction of the infection with unvaccinated pups. These losses while regrettable are, however, insignificant when compared with what might have happened had we not had the use of distemper bacterin and serum at hand. These new remedies, while far from infallible, have undoubtedly served to protect or cure the more than twenty other dogs present when the disease was introduced. The point, however, which it is wished to bring out is the danger always attendant upon bringing your dogs or puppies to a strange climate, on an ocean voyage of at least six days, during the middle of the winter, and without taking the precaution of protective vaccination before starting the animal away from its home. Prospective dog importers are therefore urged to have a veterinarian vaccinate their dogs before taking or sending them on board the steamer for Honolulu. The treatment consists in two or three hypodermic injections at intervals of one or two days, the cost of the vaccine (three small bottles) being $1.50, to which should be added the veterinarian's fee. This treatment will in most cases protect the animals against a fatal attack of the disease. If neglected the treatment of the sick dogs is far more difficult and complicated and the mortality among unvaccinated dogs frequently reaches 75 to 90 per cent. Dog distemper is a highly infectious and very easily transmitted disease which once it gains entrance to a kennel or quarantine station is likely to attack all the susceptible animals, that is, those which have not had the disease before or been vaccinated. And even then it is advisable to avoid shipping pups or bitches in whelp during December, January and February.

Importation of Live Stock.

The past month saw the arrival of more live stock than usual and of not less than 8 dogs and 14 cats. Of most interest were the fifty Merino rams which the Parker Ranch receives annually from New Zealand. Unfortunately two of these were injured, one so badly it had to be killed and one with a broken front leg which very likely will recover.

A fine shipment of Holstein cows (15) and bulls (2) arrived for Mr. Robert Hind, while Mr. A. Robinson received 13 purebred Southdown rams and 2 Kentucky jennets. Some very good hogs, Duroc Jerseys and Berkshires also will help improving the live stock of the Territory.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

Report of Assistant Veterinarian.

Honolulu February 19, 1917.

Dr. Victor A. Nörgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit the following report for the month of January, 1917:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	T.	P.	C.
M. Reidell	1	1	0
Miss L. Macfarlane	1	0	1
E. A. Scott	2	2	0

A total of four cows were tested out of which number three were passed and tagged and one condemned and branded.

Importation of Live Stock.

S. S. Tenyo Maru, Orient—2 dogs, Geo. A. Fahys.

S. S. Lurline, San Francisco—50 Merino rams (New Zealand), A. W. Carter; 1 horse, M. H. Gould; 1 horse, Capt. V. D. Dixon; 1 Shropshire ram, L. C. Clark; 1 dog, J. F. C. Hagens; 15 Holstein cows, 2 Holstein bulls, Hind, Rolph & Co.; 11 crates poultry, various; 13 Southdown rams, 2 Jennets, A. Robinson; 1 Shorthorn bull, A. Robinson. Kahului—1 Berkshire hog, L. K. Smith; 1 Holstein cow, W. A. McKay.

S. S. Manoa, San Francisco—51 crates poultry, various. Kahului—1 crate poultry, 2 crates turkeys, Wm. Pogue.

S. S. Hilonian, San Francisco—4 Duroc Jersey hogs, C. D. Pringle.

S. S. Makura, Vancouver—1 dog, W. S. Stanley.

S. S. Matsonia, San Francisco—1 dog, N. S. Castle.

S. S. Great Northern, San Francisco—3 dogs, 14 cats, Mrs. J. C. Cameron.

Respectfully submitted,

Leonard N. Case,
Assistant Territorial Veterinarian.

Among the things recently demonstrated by the federal forest products laboratory at Madison, Wis., is that a much stronger box than the type ordinarily used can be made with less material by increasing the number of nails and by properly proportioning the thickness of the sides and ends. A loss that reaches many millions of dollars annually is, it is stated, caused by damage to goods in transit, largely because of faulty containers.

Division of Hydrography

Honolulu, February 13, 1917.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during January, 1917, is submitted:

Kauai.

The regular monthly visit to the mauka measurement stations revealed the fact that the December 18 flood, which destroyed the Hanapepe river measurement station, also destroyed the measurement station recently established on the Waiahuiu branch of the Waimea river, including the new Gurley recording instrument.

Several staff gages were destroyed and, at most of the mauka stations, much damage was done to the measurement sections in the channels, these being filled with huge boulders and debris. An estimate of the cost of repairing and replacing stations is now being prepared and will be submitted as soon as possible.

The U. S. Weather Bureau maximum and minimum thermometers, recently established at Kokee, elevation 3,550 feet (in the area suggested as a territorial camping place), showed a minimum for January of 32° F. These instruments are established, sheltered and operated in exact accordance with U. S. Weather Bureau regulations. The minimum reading for December was about 41° F.

Twenty-nine stream and ditch measurement stations and 12 rainfall measurement stations were visited, and 17 discharge measurements were made. Three stream measurement stations were discontinued (destroyed by December flood).

Oahu.

To prevent the artesian well head measurement work being suspended during the balance of the fiscal year ending June 30, 1917, this division has undertaken to keep up this work in connection with the surface hydrometric work until some provision can be made by the 1917 Legislature of the Territory of Hawaii relative to the future status of underground water investigations.

Data obtained to date from the Hillebrand Glen run-off investigation show the following interesting facts. The total period covered is from May 23, 1916, to January 31, 1917:

Average daily flow, 530,000 gallons.

Average percentage of run-off to rainfall, 22½%.

Maximum percentage of run-off to rainfall, (January) 35%.

A detailed report relative to this work will be submitted in the near future.

Twenty-two stream measurement stations and 6 rainfall measurement stations were visited, and 12 discharge measurements were made.

MAUI.

R. C. Rice spent 12 days and H. A. R. Austin 15 days on Maui. All stream and rainfall measurement stations were visited and put in good order. Seven float wells were pumped out and all foreign material removed. Twenty discharge measurements were made.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

BOARD APPOINTMENTS.

During the calendar year 1916, appointments to the following positions were made by the Board of Agriculture and Forestry, and commissions issued to the following persons:

January 6, Dr. H. L. Lyon, Honorary Plant Pathologist.

May 16, Joseph F. Rock, Special Agent.

June 21, Marion Cabral, District Fire Warden, Maui.

June 21, John Fassoth, District Forester and Fire Warden, Maui.

June 21, A. A. Wilson, District Fire Warden, Oahu.

Junt 21, Eric A. Knudsen, District Forester and Fire Warden, Kauai.

June 21, Marston Campbell, Jr., Laboratory Assistant.

June 21, Dr. A. R. Rowat, Dep. Terr. Vet., West Hawaii.

July 15, Francis B. Dodge, Forest Ranger for Hawaii.

November 28, F. S. Lyman, Jr., District Fire Warden, Oahu.

November 28, James Lindsay, Forest Ranger, Maui.

According to an article in the India Rubber World quoted by the Agricultural News, W. I., there is some prospect that the United States may become a rubber-producing country if an active attempt is made to cultivate on an extensive scale the silver-colored Guayule shrub, *Parthenium argentatum*, a member of the aster family which grows wild in many sections of the American south-west, as it does over the central plateau of Mexico. On the basis that the plant yields 8 per cent of its dry weight in rubber, which is a conservative estimate, an acre would yield 4000 lb. worth $1520, according to the present low market price of 38c. per lb. There is no doubt that, if the project is practicable, the United States would greatly strengthen its economic position if it could establish rubber within its own territory.

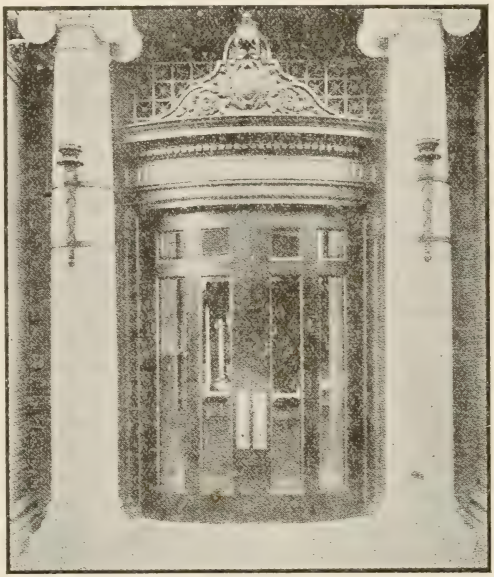
SPREAD OF COTTON BOLL WEEVIL.

A brief history of the movement of this pest through the United States suggests, from a study of specimens collected in all parts of the infested regions of North America, that there are three lines of dispersion. It seems probable that the boll weevil originated in Guatemala or some other portion of Central America, and that the most typical strain migrated northward through the mountains of Mexico into Arizona, where it is now found as a native species on the wild cotton-like plant Thurberia thespesioides. The main migration was along the Gulf Coast through the cultivated cotton regions into the United States. The third line of dispersion was through Yucatan across the Gulf, to Cuba. Specimens collected at the three termini of these dispersions appear to be very distinct varieties. That variety which is found on cultivated cotton in the United States is the smallest found and the most variable. The movement of the weevil is controlled by the amount of food supply, which regulates the time and distance of natural movement by winds and floods, and by artificial agencies.

The most interesting development of the present year is the extension of the weevil to the northern limits of cotton growth in Oklahoma and Arkansas into Central Tennessee; eastward to the Atlantic Ocean south of Savannah; and the infestation of practically all the cotton region of Florida. The only Sea Island cotton section now not infested is that of South Carolina.—Science.

Experiments made in the state of San Paulo, Brazil, by a railway company, showed that five varieties of eucalyptus possessed high fuel value. *E. rostrata* and *E. tereticonis* are represented, in a bulletin of the International Institute of Agriculture, as being "equal or superior to the best hard woods; they burn with a short flame and last a long time." *E. robusta* is mentioned among three varieties that also yield woods which are hard, though a little less so than the two just previously described.

Sisal fiber in British East Africa is stated, in the annual report of the department of agriculture of that protectorate, to have an output of 50 tons a week, which is realizing £28 to £38 ($140 to $190) a ton in the London market.



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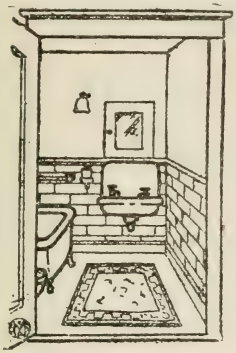
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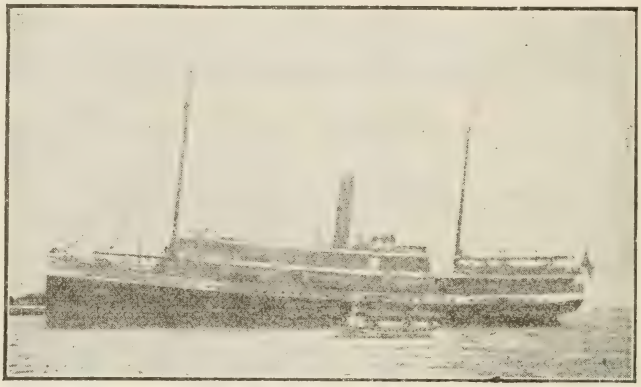
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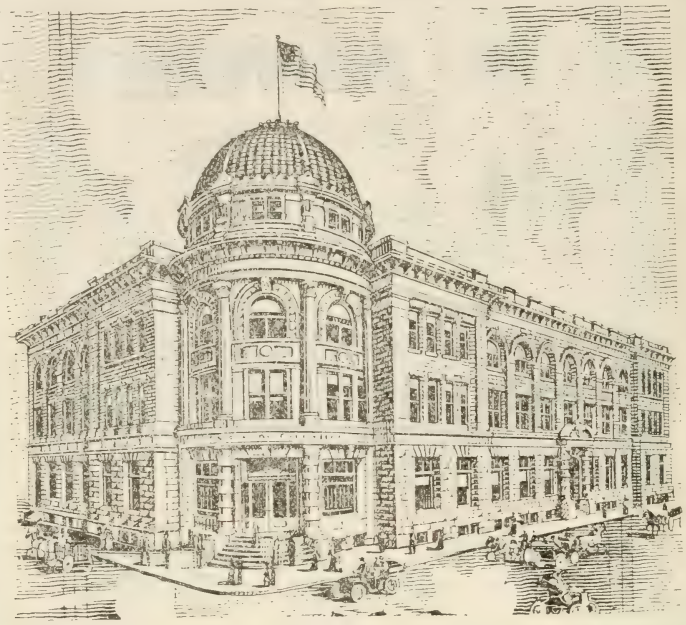
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THE HAWAIIAN FORESTER AND AGRICULTURIST

MARCH, 1917

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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale, the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, MARCH, 1917. NO. 3

WELCOME BOTANICAL WORK.

A distinct addition to our literature on the subject of trees came off the press early in March as "The Ornamental Trees of Hawaii," by Mr. Joseph F. Rock, Botanist of the College of Hawaii and Consulting Botanist of this Board. The need for this book has been felt for some time not only by local residents but also by the tourist who often wants to know something more about the beautiful trees which he sees growing here.

The book, which was published under patronage, describes practically all of the introduced ornamental trees in the islands, and also many of the interesting shrubs, fruit trees and ornamental vines. It is well printed and bound and contains 79 illuminating illustrations and in addition two color plates.

It is a book which every island resident should feel proud to have on his library shelf.

PLANT INSPECTION BUILDING.

In the interests of making more efficient the work of plant inspection which aims to prevent injurious insects from gaining an entrance into the Territory, Governor Pinkham, at the request of this Board, set aside by Executive Order No. 41 on February 14, 1916, an area of 7740.7 square feet of government land on Kekuanaoa street, Honolulu, near the waterfront. It is the plan of this Board to erect on this land suitable concrete buildings, plain in style, for the accommodation of the work of plant inspection, quarantine and fumigation.

By concentrating this work on the waterfront and furnishing suitable buildings where the inspection work can be done to the best advantage, it is believed that the work of keeping out injurious pests can be made much more efficient.

Among the promising new tree introductions in the Territory, as pointed out in the report of the Superintendent of Forestry, are the Benguet pine, *Pinus insularis*, a valuable timber tree from the Philippine forests, and the Australian red cedar, *Cedrela australis*, which is similar to but lighter than mahogany, but which is considered to be the most valuable timber tree growing in New South Wales.

Poultry raisers who are troubled with the existence of sore-head in their flocks would do well to follow the advice concerning the use of a preventive treatment, described in the report of the Territorial Veterinarian printed in this issue.

Division of Forestry

Honolulu, March 22, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of February, 1917:

Forest Reserve Matters.

On February 12 I made an inspection of the project of constructing a ditch from Hillebrand Glen to No. 4 Reservoir in Nuuanu Valley, within the Honolulu Watershed forest reserve, and found that the work was progressing in accordance with the terms of the license issued by the Land Commissioner, and approved by this Board. Very fortunately the ditch right-of-way is so located, mostly in the open, that only about six trees have to be cut in constructing the ditch.

Early in the month I served notice on several residents of Hawaii, in the region of Laupahoehoe, to remove from the land of Piha within the Hilo forest reserve, the wild and semi-wild cattle to which they purported to claim ownership by March 31, stating that after this date drastic measures would be taken by this Division, as authorized by law, to get rid of this stock which is doing damage to the forest.

Although repeated attempts have been made within the past years to round up these cattle, it has been found that on account of their wild nature and the impassable character of the country, probably the only way to get rid of them finally will be to shoot them. I deemed it best, however, to give those who claimed ownership to this stock a final opportunity to remove them.

Tree Planting.

The planting of koa trees in the open places on government land in Manoa Valley, within the Honolulu Watershed forest reserve, was continued during the month. Along the lower boundary of the reserve, on the dry hillside, a few Australian red cedar and Japanese cedar trees were also planted out.

The seed of the Benguet pine, *Pinus insularis,* received from the Director of Forestry at Manila, P. I., has germinated very well in the nursery, and several thousand trees will before long

be ready for planting out in suitable places on the higher elevations on these islands. One box containing a thousand of the young seedlings was sent to Mr. A. A. Wilson, an enthusiastic tree planter at Wahiawa, who has kindly consented to try out at his elevation any new and promising trees which this Division may be able to furnish.

During the month approximately 2000 Australian red cedar trees, *Cedrela australis,* were sent out to twenty-two enthusiastic tree planters on the six main islands of the group. These gentlemen have agreed to plant out this newly introduced tree in suitable locations, to take good care of them and to report to this office from time to time on their growth.

Biennial Report.

A considerable portion of the month was spent in the preparation of the biennial report for the Division of Forestry and in securing suitable photographs for illustrating it.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, March 22, 1917.

C. S. Judd, Superintendent of Forestry,
Honolulu, T. H.

Dear Sir:—I herewith submit a report of the work done during the month of February:

Nursery—Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold		200	50	250
Gratis	1000	5350	2142	8492
	1000	5550	2192	8742

Collections.

Collection on account of plants sold amounted to	$ 1.00
Rent of office building, Nursery grounds, for December	35.00
Total	$36.00

Collection and Exchange of Seed.

We have been fortunate in procuring through our exchange system more seed of the Bermuda juniper, *Juniperus Bermudiana*. From the Rev. Edward J. Lough, Paget Rectory, Bermuda, who visited Honolulu about six months ago we received a package of seed of this species in return for seed which we gave him. In reply to a letter sent to the director of the Bermuda Agricultural Station we received another package of Bermuda juniper. This gentleman stated that he was very pleased to hear that the Bermuda juniper was growing so well in Hawaii, and assured us that should we desire more seed he would be very glad to supply us. The high class of wood which this tree produces in Bermuda would justify us in recommending the planting of it on a large scale. The trees of this species which we planted on the trail leading up to Sugar Loaf hill are doing exceedingly well. From letters received from a number of people on the other islands who received samples of the Bermuda cedar come very encouraging reports as to its growth.

Mrs. C. C. Kennedy of Hilo, who with her husband visited Australia a short time ago, brought back a large assortment of seed which she received from the directors of the Botanic Gardens, Sydney, and the Botanic Gardens, Melbourne. From the Sydney Gardens she received 24 packages and from the Melbourne Gardens 83 packages. The seed has been handed to us to be propagated.

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 17,000 in seed boxes, 700 in transplant boxes and 200 pot grown, amounting to a total of 17,900.

Makiki Station.

The work at this station has been principally routine in connection with potting and transplanting plants. We are also making additions to the buildings made necessary by the installing of a short log saw mill. This work is being done by our own men. The setting up of the mill is completed, but the engine has not as yet been placed. Owing to the rush of work at the Honolulu Iron Works we have not been able to procure a man to put the engine in place. We have been promised a man as soon as possible, however.

Honolulu Watershed Planting.

Clearing off and making holes in the lower end of Hering Valley, hoeing the young trees recently planted and clearing trails constitute the principal work done during the month.

Advice and Assistance.

At the request of people in and around the city, the writer has made calls and given advice as follows: Calls made 8, advice by telephone 7, advice by letter 6, advice at Nursery 10.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

Division of Hydrography

Honolulu, March 7, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—The following report of operations of the Division of Hydrography during February, 1917, is submitted:

Kauai.

Only routine work was done. Several days were spent in an endeavor to locate the two continuous record water-stage recorders lost in the Waimea and Hanapepe rivers in December, 1916. These rivers are still muddy and when clear another effort will be made to locate the missing instruments.

Thirty-nine stream and ditch measurement stations were visited, and 21 discharge measurements were made. Seven rainfall measurement stations were visited.

Oahu.

An investigation of all water resources, including streams, springs, ditches, pumping plants and wells, also areas and crops irrigated, ownership of water, water rates, etc., of all valleys and localities on Oahu was started. An endeavor will be made to collect *all* available information, such as cost of ditches, structures, etc., and the history thereof, to make separate maps of each valley showing all structures and crop areas and from these data to work up a comprehensive report which will contain all available information relative to water on Oahu. The valleys of Palolo, Manoa, Nuuanu and Kalihi are now under investigation.

A considerable part of the time of the Superintendent of Hydrography and of Assistant Engineers Rice and Klise was taken up during the month in connection with the report of the

Territorial Water Commission which was printed and sent to the Governor of Hawaii on February 21, 1917.

An investigation of the headwaters of the Kalihi stream was made and a rain gage established at an elevation of about 1000 feet.

Eighteen stream and ditch measurement stations and seven rainfall measurement stations were visited, and five stream measurements were made.

Maui.

Twenty stream and ditch measurement stations were visited and 11 discharge measurements were made. A considerable amount of minor repair work in the nature of clearing trails, cleaning out intake pipes, etc., was accomplished.

Biennial Report.

A report of the operations of this Division for the biennial period ending December 31, 1916, was completed on February 5 and submitted to the Board.

Very respectfully,

C. T. Bailey,
Acting Superintendent of Hydrography.

Division of Plant Inspection

Honolulu, February 28, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of February, 1917, as follows:

During the month there arrived at the port of Honolulu 41 vessels of which 21 carried vegetable matter. Of these vessels 9 passed through the Panama Canal in transit to the Orient.

Disposal	Lots	Parcels
Passed as free from pests	877	16,928
Fumigated	3	6
Burned	33	40
Returned	1	1
Total inspected	914	16,975

Of these shipments 16,634 packages arrived as freight, 140 packages as baggage of passengers and immigrants and 201 packages as mail matter.

Rice and Bean Shipments.

During the month 26,415 bags of rice and 1738 of beans arrived from Oriental ports and after careful inspection were passed as free from pests.

Pests Intercepted.

Approximately 4679 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and 21 packages of fruit and 14 packages of vegetables were seized and destroyed by burning.

On February 3 we seized seven boxes of oranges which arrived from Japan and destroyed them by burning.

On February 5 a passenger brought one azalea plant and a thuya plant from Japan. The plants were fumigated and the soil removed and replaced with sterilized soil. On the azalea was found a coccid *(Phenacoccus azaleae)*, and in the soil around the thuya were found 24 weevil larvae, a few ants and an earwig. All the soil was burned. Two packages of tree seed from Java for J. F. Rock were fumigated with carbon bisulphide as a precaution, as well as two packages of juniper seed from the West Indies for the Forester.

One package of tree seeds from Suva, Fiji, came by mail and was returned to the sender by the postmaster.

Seven cases of beneficial insects arrived during the month and were turned over to the entomologist of the H. S. P. A. Four of these cases coming from Java were retained by me and were destroyed at the request of Mr. Fred Muir, as the material was in bad condition and useless.

Hilo Inspection.

Brother Matthias Newell of Hilo reports the arrival of seven steamers and one sailing vessel. Five steamers brought vegetable matter consisting of 228 lots and 2202 packages of fruits and vegetables, which were found free from pests. The sailing vessel brought lumber.

During the month the S. S. Kujo Maru arrived direct from Yokohama and other Japanese ports bringing 1550 bags of rice, 290 bags of beans, 1 box yams, 1 bag peanuts and 4 bags sesame seed, all told 20 lots which were found free from pests. During the month I visited Hilo at the time of the arrival of this steamer and looked into the inspection personally. I found that the agents assist in every way to make the work easy for us and the hearty coöperation of the customs inspectors materially aid us. The inspection of materials from the Japanese boats is a long drawn out process. All materials have to be brought in by lighter which takes several days. No plants are allowed to land at Hilo under rulings of the Federal Horticultural Board.

Kahului Inspection.

Mr. Will Cooper, Inspector at Kahului, reports the arrival of two steamers, the Lurline, February 9, and the Manoa, February 24. These boats brought 16 lots and 511 packages of fruits and vegetables which were passed as free from injurious insects.

Inter-Island Inspection.

Sixty-three steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	641 bags
Plants	111 boxes
Vegetables	97 boxes
Fruit	3 boxes
Total passed	852 packages

The following packages were refused shipment as they did not meet with the regulations pertaining to soil and infestations:

Plants	4 packages
Fruit	5 packages
Total refused	9 packages

Respectfully submitted,

E. M. EHRHORN,
Chief of Division of Plant Inspection.

Division of Entomology

Honolulu, March 20, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—During the month of February the insectary handled 19,900 pupae of the melon fly, from which emerged 1014 females and 832 males of *Opius fletcheri*. This parasite was distributed as follows:

	Females	Males
Oahu—		
Mokuleia	75	40
Kailua	170	150
Waianae	25	15
Honolulu:		
Moanalua	225	150
Sheridan Street	215	175
Kauai—		
Hanalei	125	50
Lihue	150	95
Total	985	675

The insectary also distributed the following parasites:

Dirrhinus.

Mokuleia	250

Tetrastichus.

Lihue, Kauai	200

D. tryoni.

	Females	Males
Oahu—		
Mokuleia	100	30
Waianae	5	15
Kauai—		
Lihue	50	20
Lanai—		
Keomoku	40	12
Total	195	77

Opius humilis.

	Females	Males
Oahu—		
Mokuleia	25	20
Waianae	10	15
Lanai—		
Keomoku	25	10
Total	60	45

Corn Leaf Hopper Egg Parasite.

C. A. Rice, Lihue Kauai	300
Arthur Rice, Kailua	450
Sheridan Street	500
Makiki Nursery	975
H. S. P. A.	50
	2,275

Very respectfully,

D. T. Fullaway,
Entomologist.

Division of Animal Industry

Honolulu, March 26, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I beg to submit herewith my report on the work of the Division of Animal Industry for the month of February, 1917:

Sore-head in chickens is already becoming very prevalent. Whether this is due to the unusually wet weather cannot be determined now, but the fact remains that the poultry raisers who wish to protect their chickens by means of vaccination must begin now to secure the scabs from which to prepare the vaccine or else get along without this valuable preventive and treatment. In this connection it should be borne in mind that scabs or sores which have been treated with iodine, carbolic, crude oil, or any other remedy, cannot be used for vaccine, nor are the scabs which form subsequent to such treatment as effective as those from untreated cases. It is therefore recommended that until a sufficient quantity of scabs have been secured only the best birds be treated and that one or more culls be separated from the rest of the flock and allowed to develop scabs freely. A teaspoonful of scabs will provide vaccine for about 100 young birds and this amount may frequently be secured from three or four

birds when they are left untreated and kept on scant food. The scabs should not be picked until they come off easily and with little or no bleeding, and should then be exposed to direct sunlight until they are absolutely dry. When placed in a well-corked bottle (wide-mouthed) they may be kept for years, but if bottled before they are dry they will mold and decompose. As only the scabs from the skin, comb and wattles should be used for vaccine the usual treatment should be applied to any lesions which may appear in either the eyes, nostrils, mouth or throat, even in case of the culls which are otherwise left untreated. When the scabs are forwarded to this office for the preparation of vaccine they will be carefully weighed upon receipt and the exact amount of vaccine prepared from them will be returned to the sender by earliest mail possible. The vaccine is now preserved by the addition of one-half per cent of carbolic acid for which reason it does not decompose as readily as hitherto, but the bottle should nevertheless be kept in a cool dark place until the treatment is finished.

Chicken cholera. An outbreak of this highly fatal disease occurred in a flock of more than fifty grown chickens all of which with perhaps one or two exceptions died in the course of a few days. Chicken cholera is one of the pasteurella group of diseases like swine plague and hemorrhagic septicemia, and the outbreak in question forms an excellent illustration of the theory that exposure and lessening of vitality are the principal causes of its appearance. All of the chickens in question roosted in the trees, and when, during one of the first nights in February, a cold rain storm occurred, lasting almost from midnight to daybreak, the birds all became thoroughly chilled and began dying the following day. A post mortem examination proved the disease to be typical chicken cholera, which diagnosis was further borne out by microscopic demonstration of the polar staining hemorrhagic septicemia bacterium. Though this disease is supposed to be highly contagious none of the neighboring flocks, all of which were well housed, became infected. The two or three survivors undoubtedly must have been better sheltered than the rest of them, and while this is the first outbreak of this disease which has come to notice here for several years it should, nevertheless, serve as a warning against leaving poultry unsheltered during the rainy season.

Dog distemper was again brought to the quarantine station with two pups from the mainland which developed the disease a few days after arrival and before the preventive vaccination administered to them could take effect. One of them died, but as all the other young dogs in the station had been vaccinated no other cases occurred.

As every kennel at the station has been full during the entire month it is hoped that the weather soon will moderate sufficiently

to allow of the construction of the new kennels authorized some months ago and for which the plans are ready.

Respectfully submitted,

VICTOR A NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, March 15, 1917.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of February, 1917:

Tuberculosis Control.

	T.	P.	C.
Railroad Ranch	625	621	4

Sore-head In Chickens.

Three outbreaks of sore-head have been recorded, embracing a total of 42 chickens in all. Vaccine was administered at once, and all but seven made complete and rapid recovery. During the month 1200 cc. of c. p. vaccine was prepared.

Importations of Live Stock.

During the past month the following classes of live stock were allowed entrance at the port of Honolulu:

S. S. Niagara, Sydney: 1 dog, Geo. Bawles.

S. S. Sonoma, San Francisco: 1 ct. poultry, W. F. X. Co.

S. S. Lurline, San Francisco: 16 polo ponies, W. F. Dillingham; 27 mules, Schuman Carriage Company; 4 Shropshire sheep, R. McWayne; 1 dog (Airedale), Major Sheer; Kahului—1 horse, F. F. Baldwin; 1 ct. chicks, F. Pogue.

S. S. Wilhelmina, San Francisco: 5 monkeys, 2 lemours, 1 raccoon, 1 monkey, 1 lemour, 1 porcupine, 1 lioness, 2 cubs, 1 gibbon, 1 baboon, 1 chimpanzee, R. E. Golden, c|o Chas. Carter; 25 cts. poultry, 2 red setter pups, A. W. Mathes, c|o Judge Lymer.

S. S. Great Northern, 1 dog, C. D. Squire.

S. S. Manoa, San Francisco: 43 cts. poultry.

S. S. Persia Maru, Orient: 2 cts. Japanese games.

S. S. Matsonia, San Francisco: 1 dog, Mrs. W. D. Pelton, c|o W. F. X. Co.; 1 dog, Mrs. F. D. Sinclair.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

RABIES IN NEVADA.

The wisdom of requiring a four months' quarantine on all dogs coming to this Territory from a rabies-infested region to prevent the introduction of this dreaded disease into these Islands, where it would undoubtedly run a calamitous course, is fully justified by the distressing experience which the State of Nevada is now having on account of the ravages of this disease.

The report of the State Board of Stock Commissioners of Nevada for 1915 and 1916 gives in detail an account of the havoc which rabies has wrought in that State since its introduction in April, 1915, and the following paragraphs point out some of the troubles which Nevada is having on account of this disease.

"The introduction of rabies into the State and its dissemination over wide areas is the most serious matter of the kind Nevada has ever been called upon to face. The nature of the disease and the manner in which it is spread renders its control exceedingly difficult and its complete eradication in a State like Nevada practically impossible. The menace to human life and the extensive loss of live stock from this disease makes its introduction and dissemination a calamity.

"Rabies is a specific infectious disease to which human beings and all animals are susceptible. Once it develops it is invariably fatal. It is spread naturally by the bites of infected animals. A person or animal bitten by a rabid animal is likely to be infected, but not invariably. When human beings are bitten through clothing or animals through their hair infection may not occur, but such bites must be regarded as dangerous. A bite upon unprotected portions of the body is very likely to result in infection. Human beings may also be infected by the introduction of saliva or other glandular secretions or of nerve tissue into already existing wounds. Care must be exercised by persons dealing with infected animals or their carcasses to avoid infection in these ways as well as against being bitten.

"All animals which use their teeth as weapons of offense or defense are natural spreaders of rabies. Coyotes, wild cats, dogs and domesticated cats are responsible for most of the transference, although the danger from rabid horses, mules and hogs is not to be overlooked. Cattle and sheep suffer equally with other animals, but they are less likely to bite for anatomical reasons.

"After the symptoms of rabies develop there is no means for

successful treatment. It is then too late to arrest its progress. The Pasteur preventive treatment will protect exposed human beings against the development of rabies, provided it is undertaken in time. It has not proved so successful with animals and is generally regarded as impracticable for application to domesticated animals, not only on account of the comparative uncertainty of the results, but also because of the necessarily prolonged treatment and its expense.

"From the beginning of the outbreak in Nevada in the spring of 1915, to November 30, 1916, 89 persons who were exposed to rabies have received the Pasteur preventive treatment at the State Hygienic Laboratory at the University of Nevada. In addition, several persons have been treated privately by physicians. Of the 89 persons treated, 20 were exposed by coyotes, 43 by dogs, 14 by lynxes and cats, and 12 by other animals. Exact data as to the number and value of the domesticated animals which have died of rabies are unobtainable. It is impossible to collect such data under range conditions, more especially in the case of range cattle and horses than with sheep and farm animals. Furthermore, Nevada has no system for reporting such losses and the establishment and successful conduct of one is practically impossible. Reports indicate that the loss of live stock has been heavy. Doubtless $750,000 is a conservative estimate. With practically one-tenth of one per cent of our people exposed and given the Pasteur treatment and with a live stock loss of three-quarters of a million dollars during a period of twenty months, it will be seen that rabies constitutes an exceedingly serious problem.

"In the latter part of September, 1915, the Biological Survey sent Mr. E. R. Sans to Nevada to organize a corps of coyote hunters and direct their work. He established headquarters in Winnemucca and began operations immediately, which he has since prosecuted most earnestly, vigorously and intelligently. By October 15, 1915, he had 18 men in the field; June, 1916, his force consisted of 168 men, but was reduced about November 30 to 80. As soon as winter abates somewhat he plans to again increase his force.

"These men have hunted, trapped and poisoned coyotes and other animals. They have turned in over 15,000 pelts of animals actually secured. They have distributed over 300,000 poisoned baits. Naturally but few poisoned coyotes are secured, as they sneak away to their hiding places as soon as the poison begins to operate. It is estimated that from 45,000 to 50,000 coyotes have been killed since operations began, and that estimate is probably too low.

Cost of Field Operations.

The Federal Government has expended in this work in Nevada	$51,581.96
The State of Nevada has expended	29,511.05
	$81,093.01

"Rabies Quarantine. The affection many people exhibit toward dogs is one of the most serious obstacles to the effectual control of rabies.

"Experience indicates that a strong central control by the State is preferable to local control. Many Nevada towns adopted stringent rabies quarantines, under which no dog is allowed at large unless muzzled or upon leash, and any dogs found at large are promptly shot. This is radical but effective and should receive public support."

BY AUTHORITY.

FOREST RESERVE HEARING.

Notice is hereby given that under the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, a public hearing will be held by the Governor of the Territory and the Board of Commissioners of Agriculture and Forestry on Tuesday, the 10th day of April, 1917, at 2:30 o'clock p. m., in the office of the Board at the Government Nursery, King street, in the City and County of Honolulu, (1) to consider the defining of the limits and the setting apart as a forest reserve of a tract of government land on the Island and in the County of Hawaii, being a portion of the land of Waiakea, District of South Hilo (Panaewa) containing an area of 1,750 acres, more or less, and (2) to consider the matter of eliminating from the existing Honolulu Watershed Forest Reserve two small parcels of land, one in Makiki consisting of 3,067 square feet and the other in Nuuanu consisting of 15,627 square feet, more or less.

Maps and descriptions of the said lands are on file in the office of the Superintendent of Forestry where they are open to the inspection of the public.

At the said time and place all persons who so desire will be given full opportunity to be heard upon the subject matter of this notice and to present evidence and arguments in person, by proxy, or by letter, either for or against the setting apart of said land as a forest reserve or the elimination of said lands from the existing reserve.

LUCIUS E. PINKHAM,

Governor of Hawaii.

The Capitol, Honolulu, March 24, 1917.

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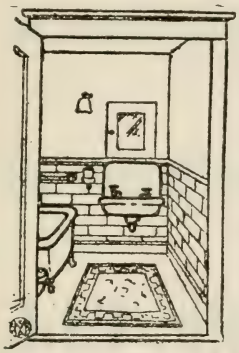
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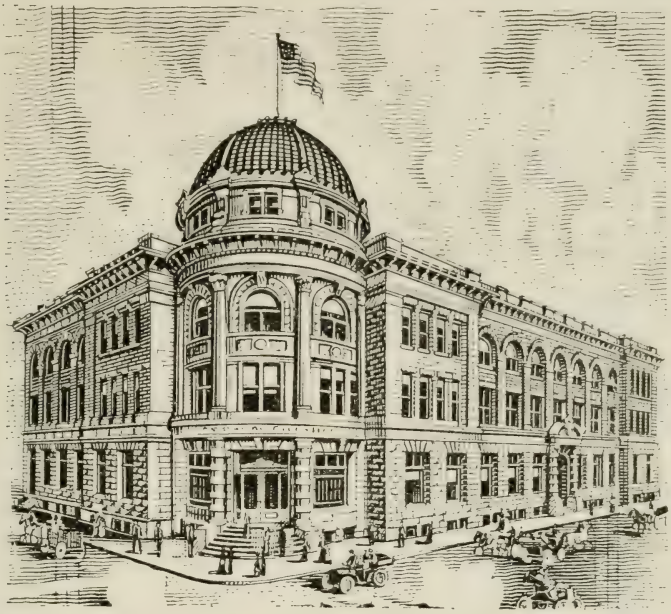
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THE HAWAIIAN FORESTER AND AGRICULTURIST

APRIL, 1917

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C. S. JUDD,
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THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, APRIL, 1917. NO. 4

A NEW FOREST RESERVE ON HAWAII.

On April 11, 1917, Governor Lucius E. Pinkham signed a proclamation creating a new forest reserve on the Island of Hawaii. This is the Panaewa Forest Reserve, which takes its name from the Panaewa Woods, a large part of which the reserve embraces. The reserve is situated on a part of the land of Waiakea in the district of South Hilo and includes 1750 acres of heavily forested land which is suited to no other purpose. The nearest part of this reserve is about four miles from Hilo and extends toward the volcano as far as the Puna boundary at Six and Three-quarter Miles. The main thoroughfare from Hilo to the volcano of Kilauea runs through a part of this reserve and the natural scenery, composed of native woods, ferns and vines, will be perpetuated by protection.

The setting apart of this reserve was considered at a public hearing held at the Government Nursery on April 10.

According to custom, the report of the Superintendent of Forestry, recommending the setting apart of this land as a forest reserve, is given herewith.

PANAEWA FOREST RESERVE.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, March 5, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

GENTLEMEN:—I have the honor to recommend the creation of a forest reserve on a part of the government land of Waiakea, Hawaii, to be known as the Panaewa Forest Reserve. The area proposed to be set apart consists of 1750 acres of forest land, called the Panaewa Woods, beginning approximately four miles out from Hilo and running south for about two and one-fourth miles to the Puna boundary line. It has an average width of about one and one-fourth miles and is bounded on the east by the tracks of the Hawaii Consolidated Railroad. The main road from Hilo to the Volcano runs through a part of the area. The land at present is under lease to the Waiakea Mill Company ex-

piring June 1, 1918, but this is no objection to creating the reserve at this time.

The land is an old lava flow well covered with an almost impenetrable growth of native forest trees, such as the ohia lehua, kukui, etc., with the accompanying growth of ferns and vines, and is not suitable for agriculture or any other purpose. One of the objects of creating this reserve is to place it under the care of this Division so as to prevent in the future the depredations of wood-cutting that have been reported to have occurred on it in the past.

While this is not a forest affecting running streams in an intimate manner, it is a forest which should be kept intact because of the possible beneficial effect which it has on the local climate. The preservation of the native growth along the Volcano Road enters into the proposition as a secondary consideration. At present this forest is not subject to much damage by wandering stock and what little attention will be needed in the future can readily be given by the forest ranger stationed on Hawaii.

The examination of this land for a forest reserve was made in accordance with the authorization given at the January 6, 1916, Board meeting and the creation of the reserve meets with the approval of the inhabitants and the Board of Trade of Hilo, and of the Commissioner of Public Lands.

For these reasons I therefore recommend that the Board approve the Panaewa Forest Reserve and that the Governor be requested to take the necessary action to have this land so set apart.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

Elimination of Land From the Honolulu Watershed Forest Reserve

At the same public hearing on April 10, 1917, the proposition was considered of withdrawnig two small parcels of land from the Honolulu Watershed Forest Reserve and there being no objections raised the Governor signed, on April 11, a proclamation which effected the withdrawal of these lands and returned them to the jurisdiction of the Commissioner of Public Lands.

One of these pieces of land consists of 3067 square feet in the shape of a triangle having a 15-foot base, adjacent to Lot 817 in the Makiki-Round Top Heights tract. This withdrawal was made at the request of the Commissioner of Public Lands so that he could use the land as a basis of exchange for land which was taken from the frontage of Lot 817 for road purposes when the Round Top Drive was constructed. The area withdrawn consists of a narrow strip of steep sandy land covered with lantana and in effect amounts only to the shifting of a short boundary of the reserve.

The other piece of land consists of 15,627 square feet in Nuuanu Valley at the sharp turn of the road near the residence of Mr. A. Lewis, Jr. It consists of a semi-circular basin with a rock rim, with only a tree or two on it, and it is entirely surrounded by patented land on all sides except along the road. None of it is needed for forest reserve purposes and the object of its withdrawal was to return it to the jurisdiction of the Commissioner of Public Lands so that he in turn could lease the land to some one who would undertake to beautify it and keep it in attractive condition.

The proclamations covering these two forest reserve matters are printed on the By Authority pages of this issue.

The Anthrax Epidemic on Kauai

On April 14 the presence of a disease known as anthrax among animals was definitely reported to the Board and steps were at once taken for the control and suppression of the disease. This is the first appearance of this disease in the Territory and the cause of its outbreak on the Princeville Plantation on windward Kauai is still under investigation. The Island of Kauai was at once put under quarantine by Rule X of the Division of Animal Industry, which was passed by the Board and approved by the Governor on April 20, and which forbids the shipping of any domestic or other animal of any class or kind from the Island of Kauai. The infected district itself was furthermore placed

under a strict quarantine, the boundaries of which are still guarded by county police day and night.

The Territorial Veterinarian at once visited the infected district, confirmed the diagnosis, arranged for the proper disposal of carcasses and prepared for the vaccination of the animals with the vaccine and serum which had been ordered by cable. Realizing the seriousness of the presence of this disease the legislature, fortunately still in session, passed a special appropriation of $25,000 for the suppression of the disease.

To date over 100 animals have died from the disease, but practically all the animals in the district have now been vaccinated and the epidemic is well in hand. Further detailed reports of this outbreak will be printed in the next issue.

Recent Legislation

Among the acts passed by the 1917 Legislature were measures on the following subjects which concern the work of this Board:

The transfer of the Division of Hydrography to the Commissioner of Public Lands. This took effect on March 23.

The separation of the Division of Entomology into the Division of Plant Inspection and the Division of Entomology, which takes effect on July 1, 1917.

The placing of the Marketing Division under the jurisdiction of this Board, effective July 1, 1917.

(By the above acts, the Board loses one Division but gains two so that after July 1, 1917, there will be five Divisions under the Board instead of four, as formerly.)

The keeping of rabbits and Belgian hares in the Territory forbidden except upon permit issued by this Board in accordance with rules and regulations to be promulgated.

Authority to pass rules and regulations for the protection of plant and animal life on several small islands on the windward side of Oahu.

Authority to pass rules and regulations to destroy Spanish moss which may become a pest in the native forests.

A special appropriation of $25,000 to combat anthrax and hemorrhagic septicemia on Kauai.

Provision for the prosecution of the campaign for the eradication of bovine tuberculosis and for indemnification of the owners of diseased animals.

Street Trees For Hawaii

By C. S. Judd, *Superintendent of Forestry.*

The progress now being made in paving the streets of Honolulu brings to the fore the question of street tree planting. This is a wide subject which deserves a great deal of careful thought and planning, but only a few of the salient points can be mentioned in this brief article.

One of the underlying principles to observe is the necessity of following some definite system for the planting of each street or portion of street. If each property owner, according to his own fancy, plants a different species of tree in front of his property, it is obvious that the results will not be homogeneous or pleasing. For proper effect, the same kind of tree should be planted on each side of the street, but the species may be changed at turns or at the end of long blocks. The Outdoor Circle has accomplished splendid results with work of this nature on many of Honolulu's streets and avenues and it is hoped that this will be continued.

The question of what species of trees to plant is always bound to come up and much of the success of street tree planting depends largely on whether this question is properly answered. A tree that has a good appearance throughout the year is, as a rule, a more satisfactory street tree than one which, on account of its deciduous habit, is devoid of leaves for several months. For this reason the golden, pink, and pink and white showers and the jacaranda, though of undoubted beauty and splendor while crowned with their attractive and gay blossoms, are rather unpresentable with their bare branches during the off season. It is a matter of individual choice as to whether the attractiveness of such trees in their blossoming period outweighs their ordinary appearance at other times.

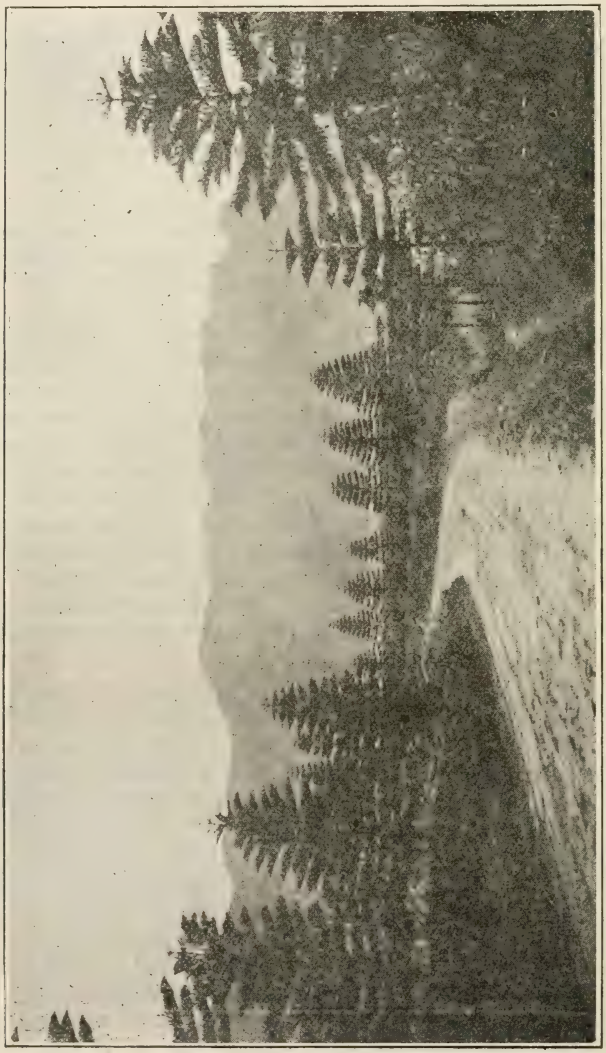
The situation has much influence on the choice of street trees, for it is obvious that trees which are not wind-firm should not be used in very windy localities. For this reason, the pepper tree, while very attractive in appearance, is not a success, because of its shallow-rooted habit, in exposed situations unless it is kept well trimmed back.

The usual tendency is to plant street trees too close to each other because at the time of planting it is hard to picture the size to which the trees will grow. In most cases it is inadvisable to plant them less than thirty feet apart, while with large-crowned trees, such as the monkey-pod, sixty feet is not too far apart.

Street tree planting, however, does not cease with merely putting the trees into the ground. This is only the starting point, for each tree should be adequately protected while small either by a tree guard or by being staked, should be trained by judicious

pruning to grow into a well-formed tree with a single trunk which will carry its crown high enough to clear all pedestrians and traffic, and even when a large tree it should have its dead branches properly removed.

The location of the trees in respect to the sidewalk and to telephone and electric wires and poles is important. It is obvious that large-rooted trees should not be planted very near a concrete sidewalk on account of the danger of lifting, and what a



Avenue of Cook Pine Planted at Kipu, Kauai, by Mr. Wm. Hyde Rice.

pity it is to see a beautifully crowned tree ruthlessly chopped and hacked simply because it has grown up into and interferes with some utilitarian electric wires! As a rule, the property side of a sidewalk is a more desirable space for street tree planting.

A variety of trees on the different streets or on portions of streets is desirable in order to break up the monotony of the planting scheme. With this in mind the following trees are recommended for street planting and are especially chosen on account of their ability to withstand the force of the usual trade winds and on account of their presentable appearance throughout the year:

The native Hawaiian koa, *Acacia koa,* especially when young, is most attractive, comparatively wind-firm, and makes an excellent street tree where the soil and moisture are suited to its demands. Splendid specimens of young koa trees may be seen in the College Hills tract in Manoa and along Nuuanu avenue in the region of Wyllie street.

The feather palm, *Cocos plumosa,* withstands the wind and is very graceful in appearance. By using it on some streets, not only will variety be secured but a taste of the tropics will be retained.

The Cook pine, *Araucaria Cookii,* is the most common of the Norfolk Island pine class in these Islands and with its symmetrical, horizontal, green branches and general Christmas tree effect pleases the eye of the Easterner. Nothing can add greater variety to the usual round-crowned trees than a few streets planted with this tree with its spire-like top.

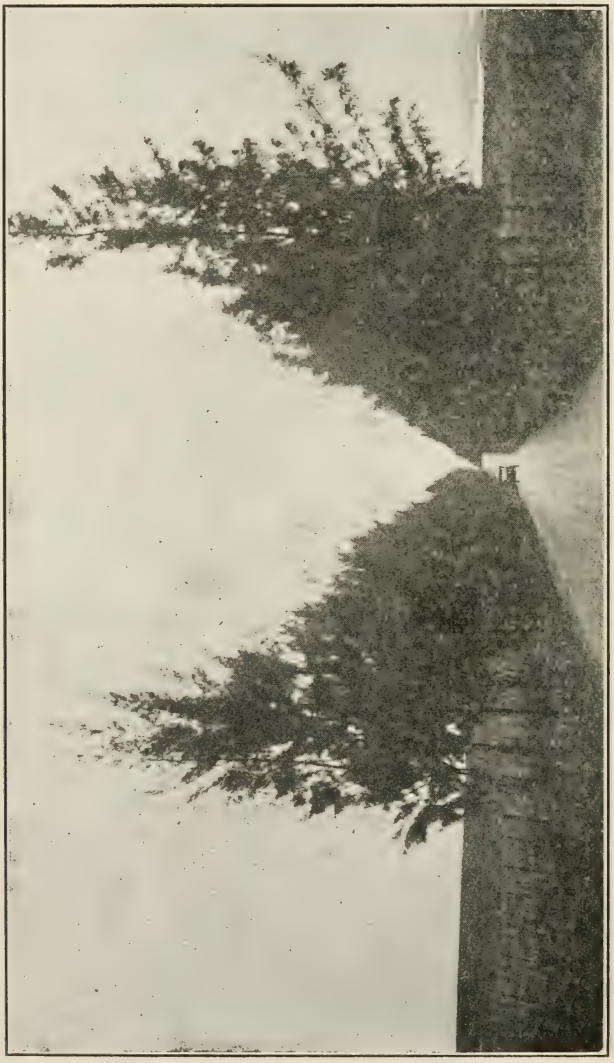
The yellow poinciana, *Peltophorum inerme,* is a stately and robust tree of the hardwood type. It is a vigorous grower and is recommended for the wider streets where there is plenty of room to show off its large stately crown which in season is covered with handsome golden yellow blossoms. (This is not a real poinciana at all and is called by the above name merely for the want of a better.)

The African tulip tree, *Spathodea campanulata,* has until lately been represented in Honolulu by only a few specimens, but now many seedlings of this handsome and stately tree are available at the Government Nursery for street planting. It is a comparatively rapid grower and for many months in the year displays a wealth of large bright orange-red blossoms.

In our country districts where it is not possible to give much attention to the trees we must necessarily use the species for avenue planting which are hardy and able to withstand adverse conditions such as drought. For planting of this nature the common ironwood tree, *Casuarina equisetifolia,* and the highland ironwood, *Casuaria quadrivalvis,* are admirably suited. A splendid example of a pleasing avenue of these two trees, here figured, may be found along the road to Waialua in the Ewa district on Oahu beginning where the road turns off to Waipahu and running for over three miles through Waipio as far as Ki-

papa Gulch. These ironwood trees were planted when the road was macadamized in 1909 and 1910 through the efforts of Mr. James C. Quinn, then Supervisor, and remain as a living monument to his memory.

Another example of a most unusual and delightful avenue of planted trees may be viewed on the Island of Kauai along the side road through Kipu to the Lihue Ranch not far from Lihue. This striking avenue consists of about a mile of the Cook pine,



Ironwood Avenue on the Road to Waialua in Ewa, Oahu.

Araucaria Cookii, which was established by Mr. Wm. Hyde Rice with seedlings which, as the writer pointed out to him in 1906, were germinating and coming up under the old trees of this species on his homestead in Lihue. To introduce a bit of color into this avenue Mr. Rice has planted choice hibiscus shrubs between each tree.

On Kauai there is another pleasing avenue of planted trees on the road skirting the brink of Hanapepe valley between Eleele and Homestead. This consists of the *Pithecolobium dulce,* commonly called the inga dulcis, opiuma, or Manila tamarind. The complete shaded canopy formed by this avenue affords to the traveler a pleasant change from the usual red dirt banks or monotonous cane fields.

In many of the more unfrequented parts of the Territory there are natural avenues formed by the algaroba tree, *Prosopis juliflora.* These are in the drier regions where shade from the heat and excessive sunlight are particularly welcome. Probably the longest of these is found on the lee shore of Molokai covering the distance of 15 miles between Kaunakakai and Pukoo. The trees of this avenue form a veritable tunnel of verdure where especially at night the air is scented with the sweet honey-giving blossoms of the algaroba or is heavy with the pungent but agreeable odor of decayed algaroba leaves. Occasionally there is a break in the avenue through which on one side may be caught glimpses of the waves rippling on the brown sands of the beach or, on the other, the steep and rugged gulches which climb back to the center of the island.

The Relation of Scouting to Forestry in Hawaii †

By C. S. Judd, *Superintendent of Forestry.*

Here the first, second, seventh, ninth and tenth scout laws are mainly concerned, for a scout must be trustworthy, loyal, obedient, thrifty and brave in his relation to the work connected with forestry.

On the mainland we hear of many ways in which Scouts have been useful in work either remotely or intimately connected with forestry. In California, Boy Scouts have effectively coöperated with the Forest Service in fire patrol work in the foothills of the Sierras, and in the Appalachian Mountains the same Service has employed Scouts in trail construction. In the cold regions of the East, Scouts have fed birds in winter and provided attractive homes for them. In the spring Boy Scouts in New England have assisted conservation associations in planting trees and have been useful in work connected with forestry, in other ways, too numerous to mention. Word has just come that for the first time in the history of its organization a state has called upon the Boy Scouts for help to battle a plague. The state is Ohio and the plague is the tussock moth, a pest that was destroying the trees of Canton, President McKinley's home town. In a two weeks' campaign the Scouts collected three million of the eggs and as a result Troop 3, headed by Scoutmaster E. R. Hoover, was awarded a large parade banner for collecting the greatest number of eggs. The American Forestry Association at its annual meeting passed a resolution endorsing the Boy Scouts' work and urged them to get into the fight against the spread of the white pine blister disease.

In Hawaii, the subject naturally resolves itself into forest work in the country and forest work in the city. While the Scouts are out on hikes in our pleasant hills and mountains they can be of assistance to those in charge of government forest work in numerous ways. We have fortunately been blessed of late with abundant showers which have watered the earth and greatly reduced the danger of grass and forest fires. But in the event of a drought or dry season, the Scouts could be of immeasurable assistance to the Territorial Forest Service, established by law, by reporting, as soon as discovered, to the nearest district fire warden or to headquarters, any grass or forest fire, or even by extinguishing the fires themselves, if possible. Boy Scouts could also be of great assistance to the Division of Forestry by reporting unlawful

† Delivered at a meeting of the Local Council, Boy Scouts of America, in Honolulu, April 12, 1917.

cutting of trees and shrubs on the forest reserves, the removal of material without permit, and other acts of trespass.

The government forest reserve lands (with the exception of a tabu area on the Honolulu Watershed in Nuuanu) are open to all, and I confidently state that all Hawaii Boy Scouts may be trusted to comply with the rules established for their preservation and protection.

In many minor ways an observant Scout can be very useful. One instance would be the diversion of a small stream of water from a trail or road during a rainy spell so that it would not continue to wash out and ruin the thoroughfares. A few minutes spent in doing this good turn, at the source of trouble, will result in the saving of many dollars' worth of road repair later on.

There are some ways in which a thrifty Scout may find remuneration in forest work. There is an increasing demand from the tourist for brightly colored and curious tree seed necklaces. In past years a weevil has destroyed almost every seed on the native koa trees so that the Division of Forestry of the Territory has offered to pay as high as five dollars a pound for clean koa seed. It has taken a good deal of scouting to obtain the amount of seed necessary for use at the Government Nursery, and who could do this work better than a trained Boy Scout? Last year's koa seed crop was rather free from bugs, but the trouble will doubtless appear again and present koa seed collecting opportunities for Scouts who have a liking for this kind of work. There are seeds of other trees, however, which are always in demand. California seed dealers charge $32 per pound for seed of the lemon-scented gum. The crop of this seed around Honolulu is scarce and the Division of Forestry is willing to pay some enterprising Scout well for his labor in collecting seed of this tree.

Forest work in the city does not smack of the open and the bracing air of the mountains, but it offers ever-present and close-at-hand opportunities. Street tree planting is done to make our city more beautiful and a pleasanter place in which to live, and it is an activity which every Scout should foster and boost. It takes 30 years to grow a tree but only 30 minutes to cut it down, and I can conceive of many ways in which Honolulu Scouts could be of service to the Outdoor Circle, the park superintendent and other organizations and officials who have the street tree work in hand. A Scout could forestall serious damage to a street tree by tying up to a post, pole or fence a horse which had been hitched to a tree, the bark of which he would delight in gnawing. A young street tree, bent over with the wind, could easily be straightened up by tying it with soft string or a strip of cloth to a firmly driven stake; or a tree guard tipped over or out of repair could with little effort be put back in a condition in which it would serve its best purpose.

I have in mind right now the undertaking of a plan for street tree planting in one of Honolulu's most beautiful residence districts in which the Boy Scouts can be of very great assistance.

This is, to have volunteer Scouts make a street tree census of the district and mark on a large scale map the location of each street tree, using different colored crayon for different species. This is simple work which Scouts have successfully performed in mainland cities and which they can well accomplish here. From the map, resulting from this tree census, a definite and uniform plan for systematic street tree planting, making use of the existing trees as far as possible, can readily be worked out. Moreover, the taking of this census affords the Scout unusual opportunities for becoming familiar with trees which will help him in his forestry test for First Class Scout and in the examination for his Merit Badge for Forestry.

In closing, permit me to relate an incident which came recently to my attention and which involved a feat that I am sure any first-class Honolulu Scout could accomplish. A friend of mine on Dole street had built a small cottage almost under a huge, towering algaroba tree. Fearing that the next storm would blow the tree over and ruin her fragile home, she endeavored to secure someone to top the tree for her. In vain she asked several Japanese to perform the job, even offering the wood and extra pay in return for the labor. Each shook his head at the tree and said, "No can." At the time, I had visiting me, as a guest from Oregon, a young fellow who had worked up from messenger, delivery boy, and an usher in a Portland vaudeville house to clerk and finally forest ranger with the Forest Service. While not registered at headquarters as a Boy Scout he had all the propensities and makings of an excellent Scout. In fact he is one of those "lads who put the *can* in *can't.*" He offered to top the huge branches from the menacing tree and at once set to work in a businesslike manner. He hired a rope and an old hand-saw and began the task in the middle of the morning. He found it a much harder job than he had imagined, but worked steadily at it without lunch until toward the end of the afternoon. With the assistance of some telephone men in guilding the fall of the last huge branch he succeeded in taking down every limb without touching the house or even disturbing the rockery and young trees which thickly dotted the yard. He had never tackled a similar job before, but, like all Scouts, he was prepared to do his good turn.

A Rare Fruit Tree of Hawaii

The Black Persimmon or Guaya-bota, *Diospyros Ebenaster* Retz.

Editor Hawaiian Forester and Agriculturist.

Sir:—During recent visits to various parts of the island of Oahu, in connection with the judging of school and home gardens, my attention was attracted to a rare and interesting fruit tree, the black persimmon. A fine specimen may be found in the old Watson homestead, in the Kaneohe district. It probably occurs here and there in old gardens and plantations on the other islands. The fruit is delicious in flavor and deserves attention. The following data comprise the first detailed account of the plant and fruit in Hawaii:

This luscious fruit is native to the West Indies, Mexico and Central America, where it is known as *"Guaya-bota"* or *"Zapota negro."* It has no common English name, but may be designated at the black persimmon. It has been introduced into Florida and California, but is almost as rare in these regions as it is in Hawaii. The fruit requires fairly high temperatures and copious precipitation for its best development. On Oahu it seems to grow well in heavy soil, providing there be sufficient drainage.

The black persimmon is a tall, slender tree, with ascending branches, and reaching a height of 18 to 25 feet. The handsome crown of foliage is evergreen, very dark and glossy. The bark of the trunk and older branches is dotted with small corky protuberances. The wood is hard, fine-grained and durable, somewhat resembling ebony in general characters. The branches are brittle, smooth, glossy and light green.

The leaves are alternate, elliptic or oblong, with obtuse apex and entire margin. The petiole is ½ to 1 inch; the blade is long and narrow, 4 to 12 inches long and 1½ to 2 inches broad, glossy dark green above, lighter beneath. The flowers are solitary, axillary, white, and fragrant; the calyx and corolla are 4-lobed.

The fruit, which is the part of economic and horticultural importance, is 2 to 3 inches diameter, globular or oblate, and bearing the enlarged calyx at the base. The rind is smooth and thin; when unripe it is light green, dotted with numerous small whitish lenticels; upon maturity it changes to a dark shining-brown. The flesh is soft, melting, juicy and fiberless. When fully mature it is dark chocolate colored or almost black, and very sweet and delicious in flavor. The immature fruit is highly astringent, as are many of this family. On Oahu, where the tree is found at the lower elevations, the fruit ripens in middle and late winter, December to February.

Each fruit contains 1 to 10 large, flat, smooth, dark-brown seeds, which are not difficult to germinate. It would be also possible to multiply the plant by means of cuttings of the mature

wood. Although slow-growing, and not generally known in the Islands, there is no doubt that the black persimmon has horticultural potentialities of no mean rank, and that some day this fine fruit will be accorded due recognition. It has been described briefly and figured by Mr. Gerrit P. Wilder, in his "Fruits of the Hawaiian Islands"—unfortunately under the name of *Diospyros decandra*—but he does not indicate the possibilities of this fruit.

It belongs to the persimmon or ebony family. The genus Diospyros (literally "Jove's grain" alluding to the edible fruit), comprises about 190 species, mostly tropical and subtropical. · The so-called "Hawaiian ebony" is the *Lama, Maba Sandwicensis* DC., which occurs on all the larger islands, but is confined to this group. It is characteristic of both wet and dry regions, and is fairly plentiful in the mountains back of Honolulu. The name of the Palama district of Honolulu, formerly called Ka-pa-lama (literally "the sacred enclosure of *lama* wood") refers to a certain sacred or *tabu* enclosure of this wood. The wood, like that of many others in this family, is dark brown, fine-textured, very hard and durable, and was prized in ancient Hawaii for sacred purposes. The common persimmon of the mainland United States is *Diospyros Virginiana* Linn.; the Japanese persimmon, cultivated in California and in season in the Honolulu markets, is *D. Kaki* Linn. f. The true ebony of commerce and fine cabinetwork is *D. Ebenum* Koenig, of the East Indies and Ceylon. There are numerous other species and varieties known to American horticulturists.

VAUGHAN MACCAUGHEY,
Professor of Botany, College of Hawaii, Honolulu.

BY AUTHORITY.

PROCLAMATION

OF FOREST RESERVE, DISTRICT OF SOUTH HILO, ISLAND AND COUNTY OF HAWAII, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given all as in said laws provided, do hereby set apart as a forest reserve to be called the PANAEWA FOREST RESERVE, subject to existing rights, a portion of that certain piece of government land called Waiakea, in the District of South Hilo, Island and County of Hawaii, Territory of Hawaii, containing an area of 1750 acres, more or less, more particularly described by and on maps made by the Government Survey Department of the Territory of Hawaii, which said maps are now on file in the said Survey Department marked Government Survey Reg. Map No. 1713 and "Panaewa Forest Reserve," and a description accompanying the same numbered C. S. F. 2722, which said description, now on file in said Survey Department, is as follows:

PANAEWA FOREST RESERVE

Waiakea, South Hilo, Hawaii, C. S. F. 2722.

Beginning at a 1¼ inch pipe on the East side of Volcano Road, about 450 feet South from the 4-mile post, said pipe being by true azimuth 251° 00′, 16.0 feet from the Southeast corner of a wooden bridge (the elevation of which is 184.2 feet), over a small ravine, and said pipe being also approximately 26,820 feet North and 3770 feet West of a Government Survey Trig. Station "Olaa," as shown on Government Survey Registered Map No. 1713, and running by true azimuths:—

1. 251° 00′ 5770 feet, more or less, to a point 20 feet West from the center line of Hawaii Consolidated Railway Company's track;
2. Thence Southeasterly along Hawaii Consolidated Railway Company's right-of-way, parallel to and 20 feet distant from the center line of track, the direct azimuth and distance being: 341° 30′ 9910 feet, more or less;
3. 49° 50′ 3670 feet, more or less, along the land of Keaau to a sign post marked "Boundary Puna District" on the Northeast side of Volcano Road at a place called "Mawae";
4. 52° 55′ 3000 feet along the land of Keaau;
5. 142° 55′ 6000 feet;
6. 232° 55′ 1416 feet;
7. 180° 00′ 1606 feet to a 1-inch pipe on the Northeast side of Volcano Road, 25 feet from the center line of road and about 100 feet East from the entrance to Robt. Young's residence, the true azimuth and distance to a similar pipe on the Southwest side of Volcano Road being 359° 25′ 52.9 feet;
8. Thence along the Easterly side of Volcano Road to the point of beginning, the direct azimuth and distance being: 168° 18′ 4540.0 feet.

Area—1750 acres, more or less.

In witness whereof, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol in Honolulu, this 11th day of April, A. D. 1917.

LUCIUS E. PINKHAM,
Governor of Hawaii.

(Seal)

By the Governor:

WADE WARREN THAYER,
Secretary of Hawaii.

PROCLAMATION

OF WITHDRAWAL OF CERTAIN LANDS FROM THE HONOLULU WATERSHED FOREST RESERVE, DISTRICT OF HONOLULU, CITY AND COUNTY OF HONOLULU, ISLAND OF OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given all as in said laws provided, hereby withdraw and eliminate from the Honolulu Watershed Forest Reserve in the District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, created and set apart by Proclamation of the Acting Governor of Hawaii, on October 13, 1913, those two certain pieces of Government land in Makiki and Nuuanu, containing 3067 and 15,627 square feet, more or less, respectively, District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, more particularly described

by and on maps made by the Government Survey Department of the Territory of Hawaii, which said maps are now on file in the said Survey Department marked Government Survey Reg. Maps Nos. 2338 and 2115 and "Portion of Honolulu Watershed Reserve, Makiki Round Top Heights" and "Portion of Honolulu Watershed Reserve, Nuuanu Valley," respectively, and descriptions accompanying the same in two parts numbered C. S. F. 2756 and 2757, respectively, which said descriptions, now on file in said Survey Department, are as follows:

PORTION OF

HONOLULU WATERSHED RESERVE

MAKIKI-ROUND TOP HEIGHTS, HONOLULU, OAHU, TO BE RELINQUISHED TO COMMISSIONER OF PUBLIC LANDS, C. S. F. 2756.

Beginning at the end of course No. 39 as described in description of survey of HONOLULU WATERSHED RESERVE (C. S. F. 2429) and at the North corner of Lot 817, Makiki-Round Top Lots, the coordinates of said point referred to Government Survey Trig. Station "Makiki," being 28.13 feet South and 1274.04 feet East, as shown on Government Survey Registered Map No. 2338, and running by true azimuths:—

1. 84° 49′ 437.9 feet along Lot 817, Makiki-Round Top Lots. (Course 40 Honolulu Watershed Reserve);
2. 195° 45′ 15.0 feet along the East side of Round Top Drive;
3. 266° 40′ 432.8 feet along Government land (in Reserve) to the point of beginning.

Area—3067 square feet.

PORTION OF

HONOLULU WATERSHED RESERVE

NUUANU VALLEY, HONOLULU, OAHU, TO BE RELINQUISHED TO COMMISSIONER OF PUBLIC LANDS, C. S. F. 2757.

Beginning at a cross on a large rock on edge of gulch, said point being 7126.4 feet North and 6305.8 feet East of Government Survey Trig. Station "Rosebank," as shown on Government Survey Registered Map No. 2115, and running by true azimuths:—

1. 18° 11′ 96.7 feet along P. W. Grant 7;
2. 145° 00′ 68.6 feet along Government Road;
3. 135° 35′ 28.0 feet along Government Road;
4. 130° 07′ 83.3 feet along Government Road to a pipe;
5. 241° 19′ 112.00 feet along P. W. Grant 45 to pipe;
6. 292° 50′ 60.00 feet along P. W. Grant 45 to pipe;
7. 326° 25′ 60.2 feet along P. W. Grant 5476 to pipe;
8. 61° 42′ 40″ 38.7 feet along P. W. Grant 7 to the point of beginning.

Containing an area of 15,627 square feet, a little more or less.

In witness whereof, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol in Honolulu, this 11th day of April, A. D. 1917.

LUCIUS E. PINKHAM,
Governor of Hawaii.

(Seal)

By the Governor:

WADE WARREN THAYER,
Secretary of Hawaii.

TERRITORY OF HAWAII.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

RULE X.

Division of Animal Industry.

Rule and Regulation of the Board of Commissioners of Agriculture and Forestry concerning the quarantine of all domestic animals on the Island of Kauai, on account of Anthrax and Hemorrhagic Septicemia.

Owing to the fact that diseases known as Anthrax or Charbon, and Hemorrhagic Septicemia, which affect most classes of domestic animals, and the former of which may be transmitted to man, have made their appearance on the Island of Kauai, it is hereby ordered:

Section 1. That there is hereby declared a quarantine of the Island of Kauai, and no domestic or other animal of any class or kind shall be shipped from nor be allowed to leave the Island of Kauai until this quarantine has been lifted by the Board of Agriculture and Forestry.

Sec. 2. That the Territorial Veterinarian shall proclaim special quarantine on such section of the Island of Kauai where these diseases are prevalent. Such special quarantine to be enforced in accordance with the direction of the Territorial Veterinarian.

Sec. 3. That it shall be the duty of any person, or persons, whether owner of live stock or not, to report without delay the appearance of any kind of disease among live stock to the Territorial Veterinarian, his assistant or deputy, as well as to assist him in every way to locate, control and suppress any and all cases of the diseases in question.

Sec. 4. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00), as provided by Sec. 529, Revised Laws of Hawaii of 1915.

This rule shall take effect upon its approval by the Governor of Hawaii.

Approved this 20th day of April, 1917.

LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii.

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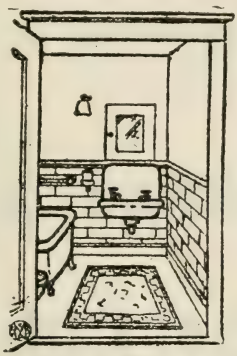
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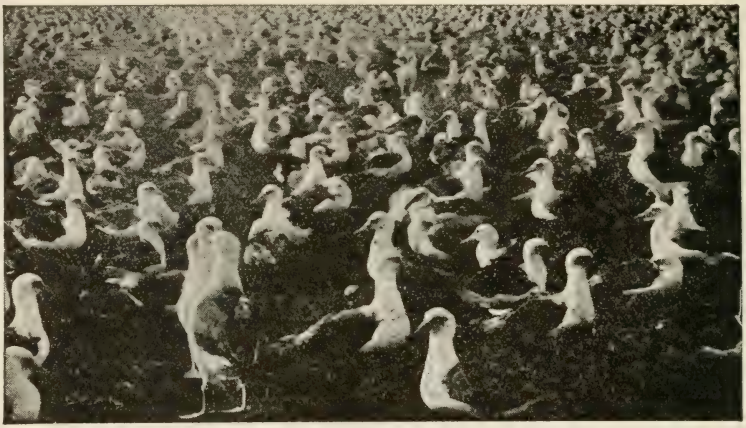
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THE HAWAIIAN FORESTER AND AGRICULTURIST

MAY, 1917

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The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, MAY, 1917. NO. 5

WARNING TO RANCHERS AND DAIRYMEN

The recent and extensive spread of the vigorous weed called Spiny Pig Weed, *Amaranthus spinosus L.*, in the pastures near Honolulu and in other parts of the Territory has prompted the Board of Agriculture and Forestry to warn ranchers and dairymen against this obnoxious plant and to use every possible means to prevent its further spread.

The Spiny Pig Weed is closely related to the Tumble Weed and the Beet Root, which are found on the mainland, and in Hawaii grows to a height of at least five feet and spreads by seed in an alarmingly rapid manner. The chief objection to this weed is the fact that it bears a pair of very sharp thorns at the base of the leaves. Cattle will not eat the plant and they shun localities where it occurs.

This weed is particularly obnoxious because its seeds, considering the size of the plant, are relatively small and are formed in enormous numbers, one plant producing as many as 115,600 seeds. Since the seeds mature long before they are suspected and are shaken off by the wind, it is important to destroy the plant before the seeds form or come to maturity, in order to prevent the weed from spreading.

It is, therefore, suggested that in order to prevent the occupation and ruination of pasture land by the spread of the Spiny Pig Weed, all persons owning or controlling such lands attack at once the weed where found, removing it by the roots and burning plant, seeds and all.

Hawaii's fruit fly control campaign is attracting attention far away. More than a page of a recent number of the Agricultural News (West Indies) is devoted to the subject, the information having evidently been gained from a federal report of the experiments conducted here by Professors Back and Pemberton of the United States department of agriculture. Referring to the four parasites introduced here by Silvestri, Fullaway and Bridwell, the article says that the data published by Back and Pemberton "show that all four parasites have successfully established themselves and already promise to be an important factor in the control of *Ceratitis capitata* in Hawaii. These parasites have so far found conditions unusually favorable, with an abun-

dance of hosts and apparently no natural enemies, and it remains to be seen how they will survive in the struggle for existence which will come later."

According to the Barbados Agricultural Reporter, a committee has been appointed with Professor J. B. Harrison, C. M. G., at its head, to consider and report to the Demerara government with respect to a recommendation made by the flour substitute committee that a sum of $15,000 be provided annually for the erection and carrying on of a factory or factories for converting raw vegetable products into non-perishable and marketable products and placing them in the market. This liberal and foresighted proposition in the colony named is only one of hundreds of symptoms of the world's awakening, through the grim stimulus of the greatest war of history, to the possibilities of increasing both the quantity and the variety of articles of human subsistence.

In view of the territory-wide activity in raising garden truck and other foodstuffs as a war-protective matter, the advice of experts cannot be too earnestly sought and appreciated. Regarding sweet potato culture in St. Lucia, W. I., A. J. Brooks is quoted by the Agricultural News as saying that much better results would be obtained if all the leaves were removed from the cuttings before being planted out. "To produce heavy yields of all root crops," the same authority says, "the land must be worked to a deep tilth to provide sufficient space for the tubers to swell. One deep, broad bank would yield more potatoes than two shallow ones."

In a letter to Tropical Life (London) from H. J. Moors, a long-established business man in Samoa, the following item appears: "We note that the lantana plague can now be overcome by engaging small colonies of flies to over-run the trees and bushes and eat the seeds as fast as they are produced. The insect comes from Honolulu, and has been successfully translated to Fiji, where his activities are just the same." Lantana, once "a holy terror" in Hawaii, is never mentioned here nowadays. The pest seems to have been effectually "done for" by the insect in question.

Occasionally the local daily press contains mention of a demand from abroad for kukui nut oil. For the benefit of homesteaders and others in Hawaii who may have become interested in the commercial possibilities of such a product, an article on the candlenut tree as known in Ceylon is reprinted in this number from the Tropical Agriculturist of that country.

The address of Dr. V. S. Nörgaard, Territorial veterinarian, before the Hawaiian Medical Association last year, is reprinted by the Tropical Agriculturist (Ceylon) for May from the Forester.

Division of Forestry

Honolulu, Hawaii, April 5, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of March, 1917.

Hawaii Trip.

From March 11 to 12 I was on the Island of Hawaii investigating several forest matters that had needed attention. The question of certain illegal occupancy of some of the forest reserve strips along the Volcano Road in the region of Glenwood and of cattle grazing on similar strips was looked into and a plan is being formulated for coöperative fencing which will end these difficulties. The new fence around Section A of the Olaa Forest Park Reserve above Glenwood was inspected and found to be in good condition.

At the suggestion of the Land Commissioner I also made an investigation of the native forest on the unleased government land of Keauohana in Puna along the road leading to Kalapana. This land, along with the adjacent lands of Kehena and ~~and~~ Keekee, had recently been advertised for a general lease but on the protest of some Hilo residents, who pointed out the advisability of retaining intact the native forest on these lands along the road, the sale was held up until such time as I could look into the matter. I found that on the land of Keauohana, the road runs through one of the most beautiful pieces of native forest that I have ever seen, consisting of tall, slim ohia lehua trees on the straight boles of which delicate ieie vines are entwined. In order to retain this forest intact and give it the necessary protection it seems best to have it set apart as a forest reserve. The area is not large, but in asking the Territorial Surveyor for a description I have specified that the boundaries should include land extending at least 1,000 feet on each side of the road. Where fencing is necessary, it is proposed to require this in the general lease when the balance of the land is advertised.

An opportunity was also afforded me on this trip to talk over the forest work on the island with Ranger Dodge and to give him instructions for future work.

Tree Planting.

Tree planting on the Honolulu Watershed Forest Reserve in Manoa has continued during the month and several hundred

koa trees were set out on government land near the head of the valley. The koa trees planted in January on the Manoa Ranger Station have shown up better than any other species and some of them are already two feet high. The Australian red cedar trees planted at the same time are also showing good growth.

A new consignment of seed of the Benguet pine, *Pinus Insularis*, was received from Manila and one pound was sent to the Parker Ranch for germination at the Keanakolu Nursery and planting out on the Mauna Kea Forest Reserve, Hawaii. A small quantity was also sent to Dr. C. P. Durney for experimental planting at the sanitarium in Kula, Maui. Five additional boxes of Benguet pine seedlings have also been shipped to Mr. A. A. Wilson for planting out at the high elevation about Wahiawa, Oahu.

Nuuanu Valley Thinning.

At the request of the City Planning Commission, with the majority of members of which I personally looked over the trees along the road in the Honolulu Watershed Reserve leading to the Nuuanu Pali, I began toward the latter part of the month and almost completed a thinning of some of the trees, mostly swamp mahogany and ironwood, at points along the road in order to open up vistas opposite waterfalls and other places of interest and to make the road visible at sharp turns in order to avoid danger of collisions.

Forest Reserve Hearing.

April 10, at 2:30 p. m., has been set by the Governor as the time for a public hearing at the Government Nursery to consider the setting apart of the Panaewa Forest Reserve in Waiakea, South Hilo, Hawaii, and the elimination of a small piece of land in Nuuanu and a small piece in Makiki, both within the Honolulu Watershed Forest Reserve. Since this is a hearing of the Governor and this Board, it is desirable that as many of the Commissioners as possible be present.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, April 16, 1917.

Superintendent of Forestry,
Honolulu, T. H.

Dear Sir:—I herewith submit a report of the principal work done during the month of March:

Nursery—Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Gratis	6000	2655	956	9611
Sold	...	300	40	340
Total	6000	2955	996	9951

Collections—Government Realizations.

Collections on account of plants sold amounted to	$ 3.50
Rent of office building, Nursery grounds, for January	35.00
Total	$38.50

Preservation Forest Reserve.

Collections for quarter ending March 31, 1917:	
Rent of lands within the forest reserves	$43.25
Sale of black sand, Makiki Valley sand pit, 81 loads at 25c.	20.25
9 poles from Makiki Forest at 25c	2.25
Total	$65.75

Makiki Station.

We have just completed the repairs and additions to the buildings which will now give us ample room for storing and seasoning timber, etc. We are also busy building up our stock of plants which was reduced considerably during the latter months of 1916.

Honolulu Watershed Planting.

Owing to the heavy rains which did considerable damage to the road leading from the main government road to the Makiki Station, we were obliged to take the men from the watershed to assist in putting the road in good condition again. Other work done consisted of hoeing and clearing away grass and weeds from the young trees.

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 500 trees in transplant boxes and 75 pot grown trees, amounting to a total of 575.

Advice and Assistance.

The writer has, at the request of people in and around the

city, made the following number of calls, or given advice as follows:

Calls made	10
Advice by telephone	12
Advice by letter	8
Calls at Nursery for advice	13

Collection of Seed.

The seeding season is just coming in and we are busy collecting seed of all the available species to be found in and around Honolulu and on Tantalus.

Respectfully yours,

David Haughs,
Forest Nurseryman.

A wood specimen found in glacial drift and estimated by the Wisconsin state geologist to be approximately half a million years old has been identified by the forest products laboratory of the forest service as spruce.

The estimated lumber cut in California for 1916 was 1,420,000,000 feet b. m. This is thought to be the largest cut for any one year in the history of the State, and is 290,000,000 feet more than the estimated cut in 1915.

State forests with a total of over 3,600,000 acres have been established in thirteen States. Of these New York has the largest forests, which comprise 1,826,000 acres; Pennsylvania is second with 1,008,000 acres, and Wisconsin third with 400,000 acres.

An office primarily for the handling of suggestions from the public has been added to the forest service organization in San Francisco. This office will be conducted along the same line as similar offices in railroad, telephone, steet car companies, and other large public service corporations. It will give special consideration and investigation to all suggestions for the betterment of the service rendered on the national forests.

In its campaign to make the national forests in California accessible and inviting as recreation regions, the forest service is planning to spend $6000 this summer in clearing the grounds and establishing camping places on the most traveled roads within the national forests. The improvements planned include suitable sanitation equipment, and signs along the highways that will call the attention of the public to the camps.

Division of Plant Inspection

Honolulu, Hawaii, March 31, 1917.

Board of Commissioners of Agriculture and Foretry,
Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of March, 1917, as follows:

During the month there arrived at the port of Honolulu 51 vessels, of which 23 carried vegetable matter. Of these vessels 6 passed through the Panama Canal in transit to the Orient.

Disposal.	Lots.	Parcels.
Passed as free from pests....	974	20,657
Fumigated	15	806
Burned	103	103
Returned	5	27
Total inspected	1,097	21,593

Of these shipments, 21,195 packages arrived as freight, 192 packages as baggage of passengers and immigrants, and 206 packages as mail matter.

Rice and Bean Shipments.

During the month 27,005 bags of rice and 1,764 bags of beans arrived from Japan and Oriental ports, and after careful inspection were passed as free from pests.

Pests Intercepted.

Approximately 6,298 pieces of baggage belonging to passengers and immigrants from foreign countries were examined, and 76 packages of fruit and 26 packages of vegetables were seized and destroyed by burning.

On March 13 a case of orchids arrived from Guatemala, Central America. The plants were fumigated, as we found the Palm aphis (*Certaphis lataniae*), and a mealybug (*Ceroputo species*) infesting several plants. We also found a nest of ants (*Pheidole species*) and a black weevil in the packing which was detroyed by burning.

On March 15 a pine tree belonging to a member of the crew who attempted to bring it ashore was returned to the vessel.

On March 17th, 4 cases of fruit trees and ornamental plants arrived from Japan. They were fumigated as we found a colony

of ants (*Prenolepis species*) in the packing material, which was burned.

On March 13, two cases of grain for A. H. Ford's exhibition arrived from Australia. These were fumigated with carbon bisulphide as a precaution.

A sago palm was found in the baggage of a Japanese passenger and was fumigated as a precaution.

One bundle of mixed cuttings and plant roots from Japan was rejected, as the party was not landing here, but wanted to bring these to a friend, which is prohibited by the Federal Horticultural Board.

The following packages were found in the postoffice:

Five packages of tree seed from Japan which were contraband and returned to the postmaster.

One package of pine tree seed for the forester, which were fumigated before delivery as a precaution.

Four packages of tree seeds from Argentine for the Hawaii Experiment Station, which were infested with weevils were fumigated before delivery.

One package of tree seeds from Borneo for Mr. J. F. Rock were also fumigated as a precaution before delivery.

An orange and some green ginger were found in a package of merchandise from Japan and were seized and burned.

One package of Mantis eggs came from Japan for a party on Maui. The Mantis is a beneficial insect, but such a general feeder that it is thought best not to introduce it into the islands.

During the month four baskets of beneficial insect material arrived from Manila for the H. S. P. A., and were delivered to Mr. O. H. Swezey and opened in my presence. All soil and packing have been destroyed.

Hilo Inspection.

Brother Matthias Newell reports the arrival of seven steamers of which four brought vegetable matter, consisting of 207 lots and 3,522 packages. Two cases of celery had to be cleaned from clinging earth.

Kahului Inspection.

Mr. Will J. Cooper, Inspector at Kahului, reports the arrival of seven steamers of which two brought vegetable matter. These boats brought 11 lots and 305 packages of fruit and vegetables which were passed as free from pests.

Mr. George B. Leavitt having been appointed Honorary Inspector for Eleele, Kauai, has been sent the necessary instructions and the rules and regulations pertaining to the inspection of plants and fruits.

Inter-Island Inspection.

Fifty-eight steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	600 bags
Plants	160 boxes
Vegetables	189 boxes
Fruit	8 boxes
Total Passed	957 packages

The following packages were refused shipment, as they did not meet with the regulations pertaining to soil and infestations.

Plants	8 packages
Fruit	9 packages
Total Refused	17 packages

Respectfully submitted,

E. M. Ehrhorn,
Chief of Division of Plant Inspection.

It is a common mistake in growing vegetables not to make the soil fine enough, and the seeds are sown among small clods. At other times the soil is in too soft a condition, and the seeds are planted to loose soil. Such soil conditions are often responsible for unsatisfactory germination or at least weak development. Very often vegetable seed is planted too deep. The smaller the seed the shallower it must be planted; peas may be planted two inches deep, lettuce seeds merely raked in and barely covered. Seeds should never be sown too thickly.—*Agricultural News.*

In contradistinction to school gardens, home gardens are becoming increasingly popular in Canada. The Agricultural Gazette of Canada contains an account of the progress made in various provinces, and it appears that the scheme is successful and useful. A good deal depends on the assistance and supervision of the visiting teachers. It appears that the pupils take a greater interest in home gardens than in school gardens, which is only to be expected in view of the fact that the home garden is entirely in the pupil's own hands.—*Agricultural News.*

More than a thousand million pounds' weight of coffee comes to the United States, according to the Louisiana Planter, which then goes on to say that Dr. L. K. Hirshberg, of the Johns Hopkins University, says that coffee is a food, a whip, a fertilizer, a heat-maker, a true stimulant, a thirst quencher. Roasted, it contains over 13 per cent fat and oil, but little or no moisture.

Division of Entomology

Honolulu, Hawaii, April 11, 1917.

Board of Comissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—During the month of March the insectary handled 31,300 pupae of the melon fly. From these there were bred 524 females and 682 males, *Opius fletcheri.*

The distribution of parasites was as follows:

Opius fletcheri.

	Females.	Males.
Oahu—		
Sheridan Street	115	135
Kailua	150	60
Niu	170	150
Waianae	110	80
Pearl City	50	20
Hawaii—		
Paauhau	100	75

Opius humili.

Oahu—		
Kaimuki	110	10

Diachasma tryoni.

Kaimuki	30	13

Paranagrus (Corn leaf hopper parasite).

Makiki	3,350
Moiliili	250
Pearl City	250
Kailua	600
Kauai—	
Lihue	2,400
Molokai	450

Respectfully submitted,

DAVID T. FULLAWAY,
Entomologist.

Balsa wood, found in Central America, is said to be the lightest known wood. It is lighter than cork and has an average specific gravity of only .104.

Division of Animal Industry

Honolulu, Hawaii, May 4, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I have the honor to submit herewith the report of the Division of Animal Industry for the month of March, 1917:

Tuberculosis Control.

The following dairy cattle have been tested during the month:

	Tested.	Passed.	Condemned.
O. R. & L. Co., Mokuleia Ranch..	411	404	7
" " " ..	42	40	2
" Kawailoa Ranch..	65	62	3
Chas. Mascke, Kaimuki	1	1	0
Walter Love, Niu Ranch.....	35	33	2
Chas. Lucas, Niu Ranch	143	140	3
K. Sato, Gulick Avenue.....	12	11	1

From the above list it will be seen that a total of 709 head were tested, out of which number 691 were passed and tagged and 18 condemned and branded. In every case when possible post mortem examinations have been made of the condemned animals. The 12 cows slaughtered of the O. R. & L. Company were slaughtered at the Honouliuli abattoir and were presumably inspected by the health officer of that district. Only one condemned cow was segregated in order to allow it to calve before being slaughtered.

Sorchead in Chickens.

The demand for vaccine for this disease is still increasing. During the past month 18 chickens were injected, and 1000 c.c. of chicken vaccine was sent to Mr. P. M. Pond, Kemoo Farm.

Importations of Live Stock.

S. S. Makura, Sydney—1 dog, M. F. Evans.

S. S. Makura, Orient—1 ct. (4) Japanese game, I. Hinita.

S. S. Lurline, San Francisco—1 horse, Capt. H. C. Pratt; 3 horses, Capt. H. F. Graham; 2 horses, Lieut. V. T. Erwin; 4 hogs, A. B. Humphrey; 5 hogs, L. K. Smith; 5 hogs (Hampshire), J. H. Wilson; 2 collie pups, Dr. J. H. Raymond; 44 mules, Schuman Carriage Co.; 29 cts. poultry.

S. S. Wilhelmina, San Francisco—4 cts. poultry, 1 ct. guinea pigs, 1 ct. pigeons, W. F. X. Co.

S. S. Manoa, San Francisco—1 ct. quail, 1 can live fish, W. F. X. Co.; 1 dog and 6 pups, Dr. Fitzgerald, Maui; 29 cts. poultry.

S. S. Matsonia, San Francisco—1 dog, City Transfer Co.

S. S. Great Northern, San Francisco—1 dog, R. N. Horton; 1 dog (Brussill Griffon), Mrs. Weir.

Blackleg in Cattle.

As reported to the Board verbally, a case of blackleg had occurred on a ranch in Kalihi during the early part of the month, and in order to guard against the further spread of this disease, blackleg vaccine was cabled for and arrived a week later from San Francisco. With this preventive the remaining young stock on the ranch, seven head in all, were vaccinated, and no further cases have developed since that time. The origin of the disease has not yet been ascertained. It is claimed that no bone meal has been used on the ranch in the salt licks, nor has bone meal been sold as a fertilizer in that neighborhood or within a distance of a couple of miles from the place of infection.

Leave of Absence.

Owing to ill health in his family, Dr. H. B. Elliot of Hilo was granted a leave of absence from his position as deputy territorial veterinarian, for a period of six weeks, dating from March 28, and the assistant territorial veterinarian, Dr. L. N. Case, was directed to fill his position at Hilo during Dr. Elliot's absence.

Animal Quarantine Station.

The two collie pups which arrived on the steamship Lurline during the early part of this month were both affected with dog distemper at the time of their arrival, and both died from the disease. This new introduction of this easily transmitted infection again necessitated the vaccination of all the young dogs in the station, and none of these up to the present writing developed the disease.

The construction of new kennels will be begun as soon as pressure of work will permit.

Very respectfully,

VICTOR A. NORGAARD,

Territorial Veterinarian.

What is believed to be the largest Hevea rubber tree is described in the India Rubber World. The tree, which is situated near the river Acre, in Brazil, is 127 feet in circumference at the base, and has a record of yielding for 120 days an average of 22 pounds of rubber a day.

The Mangosteen in Hawaii

By Vaughan MacCaughey, *Professor of Botany, College of Hawaii.*

Numerous requests have been received by the writer for information concerning the famous mangosteen and its relatives. The following data has been prepared with the hope that it may be of interest to your readers, as the mangosteens have a very important place in tropical horticulture.

The mangosteen, *Garcinia mangostana* Linn., receives its name from the native Malayan *mangonsta*. It is a native of the East Indies, and requires a hot, fairly equable climate. It is cultivated to a very limited extent in the West Indies. Innumerable attempts have been made to naturalize this valuable fruit tree in various parts of the tropics, but these efforts have seldom met with success.

Many trees have been brought to the Hawaiian Islands, from time to time, but have not thrived, and eventually have died. At the present time there are only two trees known in these islands—one on Kauai (Francis Gay), and one on Maui (Harry Turton). The mangosteen is recognized as one of the most localized cultivated plants in the tropics; its range is very small, and outside of that range it is excessively rare.

The tree is very slow-growing; 20 to 30 feet high, with a symmetrical round-topped crown, conical in shape. The bark and wood are long and 3 to 4 inches wide; elliptic-oblong, entire, acuminate, and leathery. They are beautiful glossy green above; olive below; the veins are horizontal and very numerous.

The male flowers resemble small single roses, with purple or yellow-red petals; these flowers are 1½ inches in diameter, and are arranged in few-flowered terminal fascicles. The sepals are orbicular; the petals are broad ovate and fleshy.

The mangosteen fruit has been pronounced by experts to be the most luscious of all tropical fruits. It is round, the size of a small orange, 2½ inches in diameter, with a rind of similar thickness and edible segments of form and arrangement like those of an orange. The thick rind yields a very astringent juice, rich in tannin, and containing a gamboge-like resin. The fruit bears the persistent calyx. The rind is green at first, later becoming brilliantly colored with rich purple, marked with gray or yellow spots. It is sometimes reddish brown or chestnut. The pulp is soft, juicy, snow-white or rose colored, and of indescribably delicious flavor and perfume. There are many large flat seeds.

Although the fruit of the true mangosteen is unknown in Hawaii, its close relative, the Yellow-fleshed Mangosteen, *Garcinia xanthochymus* Hook. f., is quite common. This tree is native to

India, and was first introduced into Hawaii by Albert Jaeger. In other places it is used as a stock upon which to inarch the true mangosteen. It is a beautiful pyramidal tree, with a dense crown on dark green glossy foliage. The leaves are long, narrow and leathery, and of distinct ornamental value. The flowers are axillary and resemble those of the mangosteen.

The Yellow-fleshed Mangosteen ripens from November to February. Mature trees give good yields. The fruits are about the size of a peach, with smooth, thin, golden yellow skin. The flesh is also bright yellow; it is very juicy, somewhat sour, and contains numerous large seeds. These fruits are not uncommon in Honolulu gardens but do not appear in the markets.

The genus Garcinia belongs to the Guttiferae, and was named in honor of Laurent Garcin, a French botanist and traveler (died 1752), who lived and collected in India. It is a polymorphous genus of 150 or more species, in tropical Africa, Asia and Polynesia. They are usually trees, with a yellow juice. The leaves are evergreen, opposite or ternate simple, often thick. The flowers are solitary or fascicled, polygamous or dioecious; sepals and petals, 4; stamens in male flowers many, 2- or 3-delpnous; female flowers with staminodia; ovary 2- to many-celled, with sessile stigma and solitary ovule in each cell; fruit fleshy with a thick rind.

The so-called "Wild Mangosteen" of the East Indies is a common tree (*Diospyros peregrina*), with a dense crown and astringent fruit. The Gamboge tree (*Garcinia morella*) is a native of southern Asia, whose resinous juice yields the well-known yellow pigment and purgative. The "Kokum Butter" of the East Indies is a solid oil derived from the seeds of *Garcinia indica*.

Other members of this family, which are of interest, are the familiar Hawaiian kamani, (*Calophyllum inophyllum*), common along the island beaches and used for calabashes and cabinetwork; and a fragrant shrub, *Cratoxylon polyanthum* var *ligustrinum*. A good specimen of the latter may be seen in the Queen's Hospital grounds.

It is to be earnestly hoped that in time the true mangosteen may be acclimated in Hawaii and thoroughly established here. It would be a great horticultural asset to Hawaii, as it is unquestionably the finest fruit which the tropics has produced.

So far as is known to the writer, the above account is the only comprehensive statement concerning the mangosteen fruits in Hawaii. Brief notes are given by Wilder, Bryan, Higgins and others.

Candlenut Oil as an Industry

(Tropical Agriculturist.)

Candlenut is the local "tel-kekuna" or "rata-kekuna" and is the *Aleurites triloba* of the scientist.

One of the many ornamental trees naturalised in many parts of India is the Belgaum or Indian walnut or candlenut tree (*Aleurites moluccana*). The home of this tree stretches from the Pacific Islands through the Malayan Archipelago to Further India, and it is abundant in New Caledonia, Queensland and New Guinea. It appears to prefer a protected situation, hence it is common in the woods and especially plentiful in narrow valleys and ravines up to an altitude of 2600 feet above sea level. Its roundish fruits are about the size of a small apple and consist of a thick fleshy rind, containing one or two heart-shaped seeds which are very hard-shelled and of the size of a horse chestnut. The oil, which is present to the extent of over 60%, is almost colorless, rather thick and of agreeable taste and smell when cool pressed. If warm pressed it is brown and disagreeable in taste. It is highly prized for burning and serves as a lubricating oil and for soap-making. The natives of the Pacific Islands take the nuts out of the rind and roast them over a fire until the shell can be broken with the tap of a stone. The kernels are then threaded on a splinter of bamboo or on the midrib of a coconut leaf. They then bind round a few strings of seeds with bark or leaves and obtain a bright burning but sooty and disagreeably smelling torch. This is the origin of the word "candlenut tree." The torches, because they burn brightly, are used for fishing at night. The half-ripe fruits with salt have a delicate flavor, but the ripe fruits are unwholesome and only eaten in time of scarcity.

The candlenut was not hitherto considered as of commercial importance in Ceylon. The trees were growing wild and people collected the seeds from which oil was pressed. But since kerosene came into general use, oil-pressing has been practically abandoned and trees were cut and the timber used for making tea chests, despoiling all village gardens of trees on which the saw could operate.

This is a subject which hardly needs introduction to the local residents, as the sight of the tel-kekuna or rata-kekuna tree—distinguishable at a glance from among the forest growth by the silvery shade of the young foliage and noticeable as one passes in the train or along the road—is too frequent to escape attention.

Local Conditions.

The tree is never cultivated but grows spontaneously in gardens from self-sown seeds. It is quick-growing and begins to

bear at the end of the second year. It grows with a wide head; the fruits ovoid in shape and ashy in color containing two or more heart-shaped hard-shelled seeds with white kernel which contains over 60% of volatile oil uninflammable without the aid of a wick. The oil is rather thick, very drying, pale yellow and slightly bitter to taste. It is useful in painting and making varnishes. It is not fit for edible purposes, because of its purgative properties. When warm-pressed, as is generally done in the wedge oil-press, it is brown and disagreeable in taste but is a good lubricating oil. Locally the oil is used only for burning in the brass lamp (pâna).

Commercial Value.

For the above purposes it is much sought for in the United Kingdom and the U. S. A. and recently there was an inquiry from the Imperial Institute as to whether consignments of from 10 to 20 tons of the oil would be available in Ceylon. A survey in the Kandy district disclosed that about 25,000 bottles would be available in the season (April to July) while a merchant to whom the matter was referred reported that a ton would cost Rs. 400 as against 600/- for coconut oil.

The oil is extracted by first crushing the kernels in a mortar, steaming the powder over a boiling pot of water and then pressing (inside a basket made of the spathe of the kitul flower) in the wedge oil-press.

Manurial Value.

The oil-cake contains a large quantity of nitrogenous material and is highly prized as a manure, being equal if not superior to castor-cake. The leaves form a valuable green manure—the decayed leaves producing an excellent humus. The roots, so far as is known, do not interfere with any other plantation on the land. It is the experience of the cultivators that fields above which kekuna trees stand derive much benefit from the refuse of the tree—decayed leaves, rind and shell of the fruits—washed in the rains. It is their experience that no artificial or other organic manure is so beneficial as the oil-cake for wasted fields.

In Ceylon there is another tree known as kekuna. It is distinguished by the prefix dik—as against tel—or rata—for candlenut. It is the *Canarium Zeylanica* of which the nuts resemble the Brazil-nut. A resin is obtained from the tree and used for fumigating purposes, while the kernels are used in certain sweetmeats. These are found in Batticaloa, Chilaw and Rakwana districts.

Possibilities as a Commercial Product.

The candlenut oil sells locally at between 20 and 25 cents the bottle. Between 12 and 15 bottles of oil can be extracted from a

bushel of nuts. About 3200 nuts go to a bushel and it is calculated, judging from the heavy bearing character of the tree (it is a usual sight to see several branches of a tree coming down through the weight of the crop), that a yield of 4 to 6 bushels per full grown tree, or even at times up to 7 or 8 bushels, should be obtained. This represents anything above Rs. 15/- per tree at the present local valuation of the oil—not taking into consideration the manurial value to be derived from the cake. The tree requires little or no cultivation. An acre left to the candlenut tree should prove a very remunerative plantation for the owner. On the above estimate, at the rate of 25 to 30 feet apart per tree, owing to its spreading habit, 60 trees will cover an acre with some other crop, for which the candlenut should serve as a valuable shade. Candlenut trees should therefore prove a safe inter-crop and a profitable industry.

Demand.

The foreign demand for the oil is insistent, but with the hand wedge-press to express the oil, it is difficult at present to guarantee shipments of 10 to 20 tons, though according to a broker and commission agent in Colombo who investigated the matter "there would be no difficulty in getting 50 to 100 tons, but it would mean sending out a regular army of collectors and having stores at Kandy and other centers."

As demand creates supply, supply must necessarily create demand and, if those so situated as to be able to set apart a small plot for the tree would ponder over the possible industry that will ultimately be created, Ceylon should become one of the principal suppliers to America and England of the oil which is so much in demand.

The candlenut tree being of speedy growth would also prove a valuable fuel to meet estate requirements.

J. S. De Silva.

The United States geographic board has approved the changing of the name of Bald mountain, near Sumpter, Oregon, to Ireland mountain in commemoration of the late Henry Ireland, who, for ten years, was supervisor of the Whitman national forest on which the mountain is located. Ireland mountain is 8330 feet high, and has a forest service lookout station on its summit.

Fountain of Youth in Bananas

"The Banana" is the title of a six-page broadside, six newspaper columns to the page, issued in Boston in connection with the conservation of food campaign. It is filled with articles and terse paragraphs setting forth the high food value, joined with wholesomeness and cheapness, of the banana. One of the articles, being from the New York Tribune, is reprinted below. In connection with Edison's recommendation therein of the banana as a rectifier of the digestive system, it can be stated that the late Hon. James I. Dowsett of Honolulu used to give practically the same advice to his friends—eat one or two ripe bananas an hour or more before the regular breakfast.

Following is the article from the New York paper already mentioned:

The banana received a tribute yesterday from a great man. General Rafael Reyes, former President of Colombia, now here to aid in obtaining the approval at Washington of the treaty which is to give Colombia $25,000,000 for the loss of Panama, attributes his present fine physical condition at sixty-five years to the banana. At the same time, he paid his compliments to Thomas A. Edison, who it was that gave the Colombian statesman the secret of health and longevity, which General Reyes said he is anxious to give to the world.

True it is that General Reyes today looks in better health and more vigorous than he did when he was here two years ago. And when this was mentioned to him, he enthusiastically told of the valuable information given him by Mr. Edison. It was something General Reyes did not know, although he comes from a great banana-producing country.

Three Great Properties of Banana.

"General," said Mr. Edison, in giving his simple health formula, "the stomach is like the boiler of a steam engine. It must be kept clean to work with regularity. Chemical analyses have been made of all the fruits and vegetables of the temperate and tropic zones, in search for one which should give strength to vital cells by containing the three elements essential thereto—nourishing food and tonic to purify the blood, phosphorus for the brain, and, what is more important, an efficient and mild laxative for the stomach.

"These three qualities have been found in the banana, especially in the one called 'Pacifico,' which grows in Colombia, and the one called 'De La Isla,' which grows in Lima.

"Every morning, two hours before rising, eat one or two very ripe bananas—the peel must be black—and masticate them very carefully. Immediately afterward drink one large glass of very

cold water. For two hours afterward lie in bed, which facilitates the cleansing of the stomach and the assimilation of the phosphorus and nutritive substances."

On Banana Diet Two Years.

"I have not failed one day in the last two years to follow this beneficial régime," said General Reyes, "and it has given me back my health. Numerous friends in Patagonia, Chile, Ecuador, Peru, Panama and other countries where I traveled and to whom I gave this great remedy have affirmed its efficacy.

"Unfortunately, it is difficult to change one's habits, and out of perhaps one hundred individuals there will be but two who possess the energy to follow it. The treatment relieves or cures dyspepsia, heart-burn, disorders of the liver and kidneys, and even obesity. For children it is excellent, also for weak and anæmic persons. I give this great cure to the world, that everybody may profit by the wise advice of Mr. Edison."

PEARLS IN COCONUTS

The best known home of pearls is the oyster shell, though very fine pink pearls are found in conch shells, common on West Indian beaches. The Queensland Agricultural Journal makes reference to pearls in coconuts. It says:

"In 1911, the then Governor of Queensland (Sir William MacGregor) obtained from Mr. T. A. Williams, of Sabai Island, Torres Strait, valuable information on the subject of the diameter of space to which root cords spread out from the base of coconut trees, and courteously handed the report to us for publication. This appeared in the October issue of the Journal, 1911.

"Whilst discussing the root question, His Excellency informed us that in Hawaii (or Fiji?) he had been handed a coconut for his refreshment, and that he found inside it a valuable pearl. He saw the coconut opened, and was quite sure the pearl was not dropped into it. He gave the pearl to a lady present, who afterward wore it at some court function in London. Singularly enough, today we find in a book on 'Tropical Agriculture,' by Dr. H. A. Alford Nicholls, the following remarkable confirmation of the existence of pearls in coconuts. The author says, when describing the various parts of the nut: 'Finally a very singular and highly-prized pearl is found, under very rare circumstances, in coconuts, and a specimen has lately been added to the Museum of the Royal Gardens at Kew (1892).'"—*Agricultural News.*

Value of the Tropics

The Cinderella of the World, i. e., the tropical producing centers, is slowly but surely coming into her own. The latest tribute to her right to be placed in the ball-room instead of the kitchen is the February issue of the India-rubber World of New York. This well known monthly tells its readers that "The increasing dependence of the United States on the tropics for raw materials and foodstuffs not produced in this country is shown by the fact that more than a billion dollars' worth of tropical products were brought into this country during the fiscal year 1916. The exact total, $1,060,850,416, represented an increase of $253,208,231 over the year 1915. Imports of rubber, etc., amounted to $304,000,000 during the fiscal year 1916, against $280,000,000 in 1915, and $109,000,000 in 1905, and were exceeded in value only by sugar, coffee and fibres."

Thanks to the International Congress of Tropical Agriculturists, held at the Imperial Institute (London) just before the War started in 1914, and Mr. Staines Manders' Rubber and Tropical Products Exhibition and Congress which took place at the same time, official London, in the person of Mr. Lewis (now Viscount) Harcourt, was good enough to acknowledge that Cinderella, so far as England was concerned, ought really to leave the kitchen and take her proper place in the household of the Empire. Had it not been for the War her fairy godmother would probably by now have been able to present her with her first ball dress, i. e., the School of Agriculture and Institute of Scientific Research in Ceylon, whilst preparing a second one for her to wear in Trinidad or elsewhere in the West Indies. She will have those dresses yet, but at what date has still to be decided. Cinderella's presentation at Court will be somewhat of the nature of a movable feast, and depends on the date when peace is to be proclaimed. If our readers can tell us when the German Military Party will be forced by their down-trodden victims in Germany to own themselves beaten, then we can give some idea as to when Ceylon will offer Cinderella her first ball dress. Such costumes take some time to prepare, if they are to be worthy of the owner, but the gift ought to be made within five years of the declaration of peace.—*Tropical Life.*

In order to determine its practicability as a forest fire fighting tool, the forest service in California supplied a number of its patrolmen this season with a combination detachable shovel and hoe made to fit one handle. This tool, which is easily portable, it is hoped, will take the place of two separate tools, both heretofore considered essential in forest fire fighting.

BY AUTHORITY.

TERRITORY OF HAWAII

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

RULE XI

DIVISION OF ANIMAL INDUSTRY

Rule and regulation of the Board of Commissioners of Agriculture and Forestry concerning the quarantine of all domestic animals on the Island of Oahu, on account of anthrax and hemorrhagic septicemia.

Owing to the fact that diseases known as anthrax or charbon, and hemorrhagic septicemia, which affect most classes of domestic animals and the former of which may be transmitted to man, have made their appearance on the Island of Oahu, it is hereby ordered:

Sec. 1. That there is hereby declared a quarantine of the Island of Oahu, and no domestic or other animal of any class or kind shall be shipped from or be allowed to leave the Island of Oahu until this quarantine has been lifted by the Board of Agriculture and Forestry, except on a written permit from said Board.

Sec. 2. That there is hereby declared a further quarantine of the area bounded by the following streets and lanes in the District of Honolulu, City and County of Honolulu, Island of Oahu; beginning at the northeast corner of Beretania and Artesian streets, thence along the east side of Artesian street, thence along the south side of Bingham street, thence across Metcalf street and along the northern side of Metcalf street as far as the College of Hawaii grounds, thence across Metcalf street and along the eastern side of the lane leading from Metcalf street at the entrance to the College of Hawaii grounds, in an easterly and southerly direction past the Moiliili rock quarry to Beretania street, near the junction of King and Beretania streets, thence along the northern side of Beretania street to the point of beginning. No domestic or other animal of any class or kind shall be allowed to enter and /or leave the above described district until further notice from the Board of Agriculture and Forestry.

Sec. 3. That the moving or transfer of any dairy animal from one dairy to another or from one pasture to another within the Honolulu District, from Maunalua to Moanalua, is prohibited until further notice from the Board of Agriculture and Forestry.

Sec. 4. That it shall be the duty of any person, or persons, whether owner of live stock or not, to report without delay the appearance of any kind of disease among live stock to the Territorial Veterinarian, his assistant or deputy, as well as to assist him in every way to locate, control and suppress any and all cases of the diseases in question.

Sec. 5. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00), as provided by Section 529, Revised Laws of Hawaii of 1915.

This rule shall take effect upon its approval by the Governor of Hawaii.

Approved this 25th day of May, 1917.

LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii.

NOTICE OF CHANGE IN ANTHRAX QUARANTINE AREA.

Notice is hereby given that, effective at noon on June 5, 1917, the quarantine area described in Section 2 of Rule XI of the Division of Animal Industry of the Board of Commissioners of Agriculture and Forestry, approved by the Governor on May 25, 1917, is reduced to the area described as follows:

Beginning as the west corner of Wilder Avenue and Metcalf street, and running as follows:

1. Northeasterly 765 feet more or less to the northeast corner of Metcalf and Marques streets;
2. Easterly 131 feet along Metcalf street;
3. Southerly 256 feet across Metcalf street and along the west side of 11 ft. lane;
4. Easterly 11 feet across lane to fence;
5. Southerly 230 feet along fence to stone wall on top of bluff;
6. Southeasterly 190 feet down face of bluff and around base of sloping land to small bridge;
7. Southeasterly 560 feet along ditch along base of sloping land to premises of K. Matsumoto;
8. Southwesterly 40 feet along fence along premises of K. Matsumoto;
9. Southeasterly 117 feet along same;
10. Southwesterly 511 feet more or less along the northwest side of lane to Beretania Avenue;
11. Northwesterly 1065 feet along the mauka side of Beretania Avenue;
12. Northeasterly 236 feet along fence and cultivated ground to angle in ditch;
13. Northeasterly 630 feet along ditch;
14. Northerly 65 feet along ditch to a point near base of sloping land;
15. Northwesterly 654 feet along ditch;
16. Northeasterly 172 feet along ditch;
17. Northwesterly 215 feet along ditch and across to the north side of Metcalf street;
18. Northeasterly 420 feet along Metcalf street to the initial point.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Honolulu, T. H., June 5, 1917.

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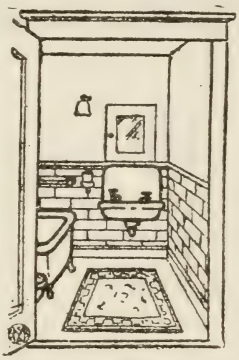
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THE HAWAIIAN FORESTER AND AGRICULTURIST

JUNE, 1917

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The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale, the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, JUNE, 1917. NO. 6

THE ANTHRAX VISITATION.

The routine report of the superintendents appearing in this issue have been belated on account of press of work due to the details of the anthrax control work. The outbreak on Kauai, as first reported in the April issue of the Forester, is described in detail in the Territorial Veterinarian's report for April appearing in this issue.

On May 24 anthrax was discovered on Oahu in the dairy herd of T. F. Farm on Metcalf street, Honolulu, and has resulted in the loss of 30 animals. On June 8 the disease was reported on Maui and to date there have been deaths from anthrax in six different places. The same precautions that were taken on Kauai, viz., vaccinating exposed animals, burning carcasses and quarantining infected premises have been taken in connection with the Oahu and Maui outbreaks and the situations on all three islands are well in hand with no cause for undue alarm. Only slightly over 300 animals all told have died from anthrax, and although the infection may remain in the soil for years, it is not anticipated that there will be many further losses of animals. A detailed account of the Oahu and Maui outbreaks by the Territorial Veterinarian will appear in the next issue of the Forester.

GOOD STREET PLANTING TREE.

The Division of Forestry has on hand a large supply of the African Tulip Tree, *Spathodea campanulata,* which is very well suited to roadside and avenue planting. A good specimen of the tree may be seen in the yard at the corner of Punahou and King streets, Honolulu. It grows to a stately height and for several months bears clusters of large orange-red blossoms. The Division recommends this tree for roadside planting where there is sufficient room, and to encourage its use for this purpose will furnish large supplies of the tree free of charge for planting along public highways to those who will plant them out and give them the necessary care during the early years of growth. To owners who desire them for planting on their own premises they will be sold at a reduced rate of one cent each.

Applications for this tree should be mailed to David Haughs, P. O. Box 207, Honolulu.

Division of Forestry

Honolulu, Hawaii, May 25, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of April, 1917:

Forest Reserve Planting.

The reforestation of the open government land in upper Manoa Valley within the Honolulu Watershed Forest Reserve was continued during the month by the planting out of about 500 koa trees. Since this is mainly a water conservation project, this native species of tree has been largely used, although a few introduced trees have also been planted on the drier slopes and ridges to determine their adaptability to the region. Since the first of the year the following trees have been planted at this place:

Koa (*Acacia koa*)	1259
Japanese cedar (*Cryptomeria Japonica*)	850
Benguet pine (*Pinus insularis*)	50
Cook pine (*Araucaria Cookii*)	50
Total number of trees planted	2209

The planting of koa trees in the Makiki valleys has continued and a considerable number of junipers have also been set out. From the last crop of seed, several thousand young mahogany trees (*Swietonia mahogani*) are being raised for close forest planting in the main Makiki Valley just back of the nursery for the purpose of commercial timber production.

On April 13 there were planted out in the open piece of land just mauka of the Tantalus eucalyptus forest, and near General Davis' house, 37 trees which Mr. J. F. Rock had kindly brought back from the Philippines in September, 1916, for this Division. They consist of the important timber trees of the Philippine Islands, and for the purpose of permanent record their names are given herewith:

Tree No.	Name.	Botanical Name.
1.	Calantas	*Toona calantas*
2.	Betis	*Bassia betis*
3.	Banuyo	*Wallaceodendron celebicum*
4.	Lumbayao	*Tarristia javanica*
5.	Alupag	*Euphoria cinerea*
6-7.	Camagon	*Diospyros discolor*
8.	Yacal	*Hopea plagata*
9.	Lanete	*Wrightia laniti*
10-11.	Batitinan	*Lagerstroemia piriformis*
12-14.	Bitanhol	*Calophyllum blancoi*
15.	Thingan	*Nopea odorata*
16.	Kamuning	*Murraya exotica*
17.	Lanete	*Wrightia laniti*
18.	————	*Hopea sp.*
19-26.	Walingmanoc	*Palacuium sp.*
27.	————	*Eugenia sp.*
28-31.	Kabal	*Palacuium sp.*
32-35.	————	*Palacuium sp.*
36.	Ipil	*Intsia bijuga*
37.	Kanyinbyu	*Dipterocarpus alatus*

These trees have been permanently staked and tagged so as to retain their identity. Since they are profuse seeders, it is planned to use them in the future as a source of supply of seed so that they may be distributed throughout the Territory.

Mr. J. F. Rock has recently also supplied this Division with a small quantity of seed of the *Albizzia moluccana* from British North Borneo. This is a tree which develops remarkably rapid growth and it is reported that it will grow to the height of 50 feet in two and three-quarter years. This seed has germinated rapidly and the young trees will soon be ready for planting.

Forest Reserve Fencing.

During the month the fence on the makai boundary of the Honolulu Watershed Forest Reserve on the southeast side of Nuuanu Valley was repaired and put in first-class shape. Cattle belonging to various owners had been getting into the reserve from makai, but now this possibility is removed. The total length of fence repaired is .37 mile and the cost of the labor and materials was borne jointly by the government and the adjoining owner, the Dowsett Company.

On April 6, with Ranger Hipple, I visited the Kuliouou Forest Reserve to look into a fencing matter at that end of Oahu. General Lease No. 837 required the lessee to construct a lawful fence on the boundary of the leased land which adjoins the forest reserve. This fence was to have been completed on No-

vember 4, 1914, and to my surprise I found that nothing had been done. The situation was reported to the Commissioner of Public Lands, who has requested the present holder of the lease to comply at once with this requirement.

New Forest Reserve.

The public hearing to consider the setting apart of the Panaewa Forest Reserve, containing 1750 acres, in Waiakea, South Hilo, Hawaii, and the withdrawal of a small piece of land in Makiki and of another in Nuuanu within the Honolulu Watershed Forest Reserve, Oahu, was held on April 10, with a full attendance of all commissioners who were in town and of the Governor and Land Commissioner. There being no objections raised, the Governor on the following day signed the proclamations setting aside this new reserve on Hawaii and withdrawing the two small parcels of land on the existing reserve.

Eucalyptus Cuttings.

On April 11 the Forest Nurseryman and I visited the cuttings in the eucalyptus plantations of the Hawaiian Pineapple Company at Waipio, Oahu, to give advice on the height to which stumps should be cut. We found that blue gum, swamp mahogany and bloodwood trees eight years old were being cut for fuel and posts, and that the posts cut from the bloodwood trees (*Eucalyptus corymbosa*) were particularly good.

Kahoolawe.

A verbal report from Mr. Eben Low made to me on April 20, soon after he had returned from his stay of five weeks on the Island of Kahoolawe, asserts that during this time 103 sheep were captured and removed from the island and that 127 goats were exterminated. Mr. Low estimates that there are still about 30 to 40 sheep and 600 goats on the island. This recalls the fact that the application of Mr. Wm. Gillies to be allowed to go to Kahoolawe for the purpose of cleaning off the goats is still pending before the Board.

This Division has purchased 100 dry coconuts which are now being sprouted at the Makiki Nursery so that they may be taken over to Kahoolawe and planted in some of the sandy coves in order to provide sustenance for whoever may possibly be stranded on the island in the future.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, May 24, 1917.

Superintendent of Forestry, Honolulu, T. H.

Dear Sir:—I herewith submit a report of the principal work done during the month of April:

Nursery.—Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	200	146	346
Gratis	100	3432	3532
Total	300	3578	3878

Collections.—Government Realizations.

Collections on account of plants sold	$ 5.05
Rent of Office Building, Nursery grounds, February	35.00
Total	$40.05

Plantation Companies and Other Corporations.

The distribution of trees under this heading amounted to 20,000 in seed boxes.

Makiki Station.

The work done at this station has been principally routine. Owing to heavy rains, which caused the stream to overflow and cut up the road, we were obliged to blast out a number of rocks in the bed of the stream and build a wall to prevent further damage. The work was done by the men working on the watershed.

Honolulu Watershed Forest Reserve.

During the month of April, 1913 Koa, 156 Juniperus Australes, 461 Sugi, 100 Cupressus Arizonica were planted; total, 1800.

Trees planted during March amounted to 552 koa and 300 algaroba; the latter were planted on the dry slope at lower end of Round Top road, close by the residence section, and the koa on the south slope of Hering Valley, near Makiki Station.

Advice and Assistance.

The writer has made the following number of calls and otherwise given advice and assistance to people in and around the city

who asked for same: Calls made, 12; telephone advice, 14; advice to callers at Nursery, 17; advice by letter, 7.

Very respectfully yours,

DAVID HAUGHS,
Forest Nurseryman.

POINTS ABOUT BANANAS.

They are wholesome.
They are nutritious.
They are cheap.
They are easily digested.
They are always in season.
They are always available.
They are available everywhere.
They are all meat.
They are easy to handle.
They are convenient for the dinner pail.
They are good food when cooked.
They are good food when not cooked.
They are the rich man's luxury.
They are the poor man's food.
They are put up and sealed by nature in a germ-proof package.
They are produced without drawing on the Nation's resources.

For the purpose of maintaining adequate supplies of fire fighting tools where most needed in the national forests of California, the forest service recently placed orders for a supply of portable knockdown tool boxes or kiosks. These boxes, made of heavy galvanized iron, are practically indestructible. Each box is 6 feet long and 2 feet square and will hold 2 dozen or more tools—such as shovels, axes, hoes, saws, rakes—used in forest fire fighting. They will be placed at the crossroads and near towns and other strategic places in the forests where fire fighting equipment may be needed at short notice. Each box is painted a conspicuous color and will be made noticeable by appropriate placards and signs.

Division of Plant Inspection

Honolulu, Hawaii, May 15, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of April, 1917, as follows:

During the month there arrived at the port of Honolulu 40 vessels, of which 25 carried vegetable matter. Of these vessels, five passed through the Panama Canal in transit to the Orient.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	767	15,129
Fumigated	8	19
Burned	84	118
Returned	2	5
Total Inspected	861	15,271

Of these shipments, 14,888 packages arrived as freight, 197 packages as mail matter and 186 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 26,677 bags of rice and 2545 bags of beans arrived from Japan and Oriental ports and after careful inspection were passed as free from pests.

Pests Intercepted.

Approximately 3387 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and 45 packages of fruit and 48 packages of vegetables were seized and destroyed by burning.

On April 5, three orchids were found in the baggage of a passenger from Manila and were fumigated. In the tree limbs to which the orchids were attached we found beetles, and a few ants were found in the packing.

On April 21, two pine trees were found in the baggage of a passenger from Japan and were seized and destroyed on account of being contraband.

On April 24, six eucalyptus trees from California were found in a shipment which were badly infested with a parasitic fungus and were destroyed by burning.

In the mail, one package of juniper seeds from the West Indies and one package of tree seeds from Japan were fumigated as a precaution. One package of corn seed from Japan found in the mail, as well as a package found in the baggage from Korea, were seized and destroyed by burning, such seed being prohibited from entry into the Territory under Notice of Quarantine No. 24 of the Federal Horticultural Board so as to prevent the introduction of certain injurious diseases of corn and closely related plants.

During the month two packages of beneficial insects arrived from Manila for the H. S. P. A. and were delivered to Mr. O. H. Swezey. All soil and packing has been destroyed.

Hilo Inspection.

Brother Matthias Newell reports the arrival of six steamers at the port of Hilo, four of which brought vegetable matter, consisting of 115 lots and 1352 packages; all were found free from pests and were passed for delivery. The steamer Anyo Maru arrived direct from Japan and brought 1190 bags of rice, 239 bags of beans, 34 bags of onions and 5 bags of sesame seed, all of which were found free from pests and allowed to land.

Kahului Inspection.

Mr. Will J. Cooper, inspector at Kahului, reports the arrival of six vessels, two of which brought vegetable matter, consisting of 13 shipments of 362 packages, all of which were passed as free from injurious insects.

Inter-Island Inspection.

Sixty-one steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	459	packages
Plants	190	"
Vegetables	155	"
Fruit	17	"
Total passed	821	"

The following packages were seized and refused shipment, as they did not meet with the regulations pertaining to soil and infestations:

Plants	5	packages
Fruit	3	"
Total refused	8	"

Respectfully submitted,

E. M. EHRHORN,
Chief of Division of Plant Inspection.

Division of Entomology

Honolulu, Hawaii, May 12, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—During the month of April the insectary handled 37,800 pupae of the melon fly parasite, from which emerged 1098 females and 886 males (*Opius fletcheri*). The distribution of this parasite was as follows:

	Females.	Males.
Honolulu:		
Sheridan Street	460	375
Moanalua	240	185
Fort Ruger	35	35
Castner	130	95
Kauai:		
Hanalei	30	25
Maui:		
Hana	75	45

The following fruit fly and horn fly parasites were also distributed:

Tetrastichus.

Honolulu:	
Pawaa	3000

Opius humilis.

	Females.	Males.
Honolulu:		
Pawaa	65	10
Makiki	100	50

Diachasma fullawayi.

Honolulu:		
Pawaa	20	20
Makiki	20	20
Maui:		
Hana	25	30

Diachasma tryoni.

Honolulu:		
Pawaa	25	10
Makiki	35	30
Maui:		
Hana	30	20

Spalangia cameroni.

Oahu:
Robinson 60

Corn Leaf-hopper and Parasite.

Honolulu:
Sheridan Street 550
Makiki Nursery 1750
Kaneohe 800
Kauai:
Lihue 1400
Molokai:
Molokai Ranch 600
Pukoo 350
Maui:
Kula 2050
Haiku 700

Respectfully submitted,

DAVID FULLAWAY,
Entomologist.

Division of Animal Industry

Honolulu, Hawaii, July 3, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I beg to submit herewith my report on the work of the Division of Animal Industry for the month of April, 1917:

Anthrax in the Territory of Hawaii.

On April 13 a letter was received from the manager of the Princeville Plantation Company, at Hanalei, Kauai, stating that about fifty head of cattle had died since the beginning of the month, and that the disease had been diagnosed by the Deputy Territorial Veterinarian as hemorrhagic septicemia.

The manager further stated that he had only taken charge of the ranch on April 1, and that he had since learned that at least 18 head of cattle had died previous to that time, and that the carcasses of these animals had been skinned and left to rot in the pasture where they were found.

The writer left Honolulu April 16 and arrived at Princeville Plantation on the forenoon of the 17th. In the meantime the Deputy Territorial Veterinarian had submitted a specimen of the blood from one of the diseased animals to the local Board of Health doctor, who had pronounced the disease anthrax.

Shortly after arrival it was reported that a heifer had just died, and a post-mortem examination was decided upon. The black, tarry blood, the swollen spleen and the extensive gelatinous hemorrhagic exudations under the skin and in the body cavities left no doubt as to the diagnosis, and subsequent microscopic examination confirmed that the disease was anthrax.

Nature and Cause of Anthrax.

There is probably no infectious disease so well known and so widely spread over the world as anthrax. Historians claim that anthrax constituted one of the seven plagues of Egypt; and many of the worst plagues, which devastated Europe and other countries during the middle ages and up to this century, can, from the description, have been no other disease than anthrax. As early as 1836 the transmissibility of the disease was proven by inoculation as well as by feeding of anthrax blood. In 1863 Davaine proved the presence in the blood of the minute, rod-shaped bodies which are known as the anthrax bacilli.

Geographical Distribution.

Anthrax is known over practically the whole world, its prevalence being influenced only partly by heat and cold, but principally by the amount of moisture required for the development and propagation of the bacillus. In the United States anthrax districts have been known along the lowlands and river bottoms in all of the Gulf States; Missouri, for instance, having suffered from periodical outbreaks ever since 1836. Anthrax is a disease of the spring and summer months, though cases may occur at all times of the year.

The cause of the disease is, as stated, the anthrax bacillus, a comparatively large rod-shaped micro-organism, which, in dried specimens, appears to have absolutely square ends. This feature is believed to be characteristic of the anthrax bacillus alone, all other rod-shaped micro-organisms having more or less rounded ends.

The bacillus multiplies by fission, whereby chains, resembling a stick of bamboo, are formed. It grows readily in milk, bouillon and other culture media, while blood offers the most favorable opportunity for its rapid development. When placed under unfavorable conditions the bacillus forms spores or seeds, which are very resistant to all destructive agents and may remain quiescent for long periods of time, but which, when again favored by heat and moisture, will develop into virulent bacilli, which, as soon as they gain entrance into the body of susceptible animals, may cause anthrax to break out.

Animals Affected.

Practically all domestic animals as well as human beings may contract the disease, though with a varying degree of susceptibility, both as regards species and individuals. The plant-eating animals, for instance, are very susceptible, while meat-eating ones are less so. Cattle and sheep, being ruminants, are extremely susceptible, and as a rule contract the fulminating or apoplectiform type of the disease, while horses and mules frequently live several days, exhibiting the local and skin form, and some cases recover. Cattle and sheep, which seemed well when last seen or fed at night, are usually found dead in the morning, while horses and mules may show extensive swellings around the throat and neck and may live for several days before succumbing to the disease. Swine are much less susceptible, but may develop the disease after feeding on anthrax carcasses. Dogs and cats are quite immune to the disease, but may contract it after partaking of large portions of anthrax-infected carcasses. All of these latter animals develop the form known as gloss anthrax, which is characterized by swellings and discoloration along the throat and neck, difficulty in swallowing, vomiting, profuse bloody diarrhoea, high fever and death.

Manner of Infection.

There are three ways by which animals may become infected, namely, by ingestion, by inoculation, and by inhalation. The most important of these is ingestion, which occurs when animals are turned out on anthrax-infected pastures. Next in importance is inoculation, which is brought about by contact of abrasion and wounds with affected material, or when the same is carried by flies or other insects from an anthrax carcass to a healthy animal. Infection by inhalation occurs when dust contaminated with anthrax spores gains entrance to the respiratory tract or the lungs of susceptible animals.

Infection of the Soil.

Soil becomes infected with anthrax by discharges from animals suffering from the disease or by the dead bodies of animals, which are allowed to decompose on the surface. It is therefore very important to limit the wanderings of affected animals to the smallest possible areas and to dispose of all anthrax carcasses in such a way as to insure the most complete destruction of the infection.

Disposal of Carcasses.

The disposal of an anthrax carcass should never be left to the owner, nor should anyone be allowed to open the carcass of an animal that is supposed to have died from anthrax. For diagnostic purposes a drop of blood may be drawn from the jugular vein by means of a hypodermic syringe, and the carcass should then be saturated with crude oil, elevated from the ground by rolling it onto a couple of fence-posts, at least six inches in diameter, and a fire built over it, which will insure its complete incineration. This will require at least half a cord of wood and from fifteen to twenty gallons of crude oil. Where no wood can be secured the carcass may be buried, but the grave should be at least six feet deep, and care should be taken that the infected surface where the carcass was lying, be shoveled into the grave first, and that the grave be well banked up to prevent it from sinking in after the decomposition of the carcass, and the forming of a pool over it. It is also advisable that such graves be surrounded by a fence.

Symptoms of Anthrax.

As early as 1893 the writer, who was then a veterinary inspector in the service of the Federal Bureau of Animal Industry, investigated an extensive outbreak of anthrax in the southern part of Illinois. His report on this outbreak was published in the annual report of the said bureau, and as it embraces many points of interest as regards the manner in which the disease generally

manifests itself in a typical anthrax district, as well as describing the symptoms of anthrax in the various classes of domestic animals, the following paragraphs are quoted herewith:

"The symptoms of anthrax will vary with the species and with the type of the disease, except that in the last stages of any of the three types the most pronounced symptoms are identical. In the most acute type the animal may appear at first to be perfectly well and keep along with its fellows even when its temperature is very high—as high as 106° F. Along with such a temperature we shall of course find a rapid pulse and increased respiration. When one is standing close beside such an animal the heart beats may be plainly heard. Soon other symptoms, such as grinding of the teeth, tremors, and standing with head down, appear. Then appear drooping of the head and ears and a disposition to lie down. Animals that have been lively will now decline to rise unless handled roughly. They become stupid and sleepy and very weak in the hind parts. Whereas the temperature has all along been high, it now shows a sharp decline, and before death may become subnormal. The visible mucous membranes are a dusky red, especially those of the rectum and vulva. There is a bloody nasal discharge. The feces will be coated with a bloody mucus. Local swellings appear in the mouth, throat, neck, and breast (especially in horses), and there are sharp attacks of colic and convulsions which end the misery of the animal in from twelve to forty-eight hours after the disease is first noticed. Pregnant animals are liable to abort and thus greatly spread the infection through the copious discharges. An outbreak has its highest mortality at its onset, while later on some animals, especially horses and mules, may recover. In the most acute types, which occur mostly in cattle and sheep, the animal is found dead. A cow which seemed well at night is found dead in the morning, or if death occurs in the daytime, the illness is of short duration, occupying only a few minutes or one to two hours. In these sudden attacks the symptoms follow each other so rapidly and death is so sudden that sometimes the owner is convinced that the animal has been poisoned. The attack is ushered in with trembling, anxious expression, high fever, rolling of the eyes, and convulsive movements, soon followed by general convulsions and death.

"In the local form or cutaneous anthrax in cattle, swellings appear suddenly on different parts of the body at one or many places, and the animal dies with the same symptoms as occur in the most acute type when the bacilli reach the circulating blood from these local lesions. When the infection occurs in the tongue or pharnyx, we have in the first case gloss anthrax, and in the latter pharyngeal anthrax, the symptoms varying somewhat, according to the part most affected; but the general constitutional symptoms will be those already described. In some cases the most prominent symptoms at first will be enormous swellings of the rectal mucous membrane.

"In the local form, or cutaneous anthrax, in the horse, the swellings occur at the points of entrance of the bacilli or spores, where there are abrasions of the skin or mucous membrane, or where biting insects have brought the infection from a previous case. These swellings appear suddenly at the point of inoculation and are characterized by a rapidly-spreading edema. The general symptoms are not so urgent, the fever is less intense, and the mortality, while not so great as in the more acute form, is still high.

"Post-Mortem Appearances.

"The animal that has died of anthrax will nearly always be found much bloated, with blood coming from the nose and rectum. There will be evidences on the ground that the animal died a violent death, in convulsions. Local swellings will be present or absent according to the type of the disease. In the rapidly fatal cases little change will be noted either in the blood or internal organs beyond those produced by high blood pressure, indicated by swollen spleen and engorged liver. The carcass itself—the edible portions—would show nothing that would make it doubtful as food. In the more prolonged cases a hemorrhagic condition will be noted in all the internal organs. The blood will be tarry in appearance and will not clot. The heart is often light in color, while on the inside it will be found deeply stained and containing dark, uncoagulated blood. The liver may be found enlarged and is easily torn in handling, presenting on its surface hemorrhagic areas. The spleen is often specially enlarged and distorted in shape, and ruptures on handling.

"The bacilli of anthrax can be found in largest numbers in those organs where the lesions are most pronounced, namely, the spleen, liver, and engorged lymphatic glands, but they are commonly found in any part of the vascular system. In the serous cavities, such as the pericardial, the pleural, and the peritoneal, may be found a sanguineous fluid consisting of serum, red and white cells, and anthrax bacilli. The hyperemia and areas of the extravasated blood may appear at any point of the body where the bacilli have become localized and enormously multiplied, forming capillary embolisms, which consist of broken-down blood corpuscles, and bacilli. Hence they are frequent in the tongue, throat, lungs, stomach, and intestinal walls; the mesentery and the omentum; the skin, connective tissue, and the muscles.

The Cause of Death.

"From the manner of death it would seem that the poison of anthrax acts specifically upon the center of respiration, this in turn allowing a fatal accumulation of carbon dioxid in the blood. That it is the replacement of the oxygen of the blood by carbon dioxid that is the immediate cause of death in anthrax is further shown by the loss in the blood of the property of coagulation, it

being known that carbon dioxid precipitates and throws out of action the fibrin-forming element of the blood—fibrinogen."

Anthrax on the Island of Kauai.

From the above description of the symptoms, nature and cause of anthrax it will be seen that the disease is one that cannot readily be carried by live animals for any considerable distance, for the simple reason that when the infection has once gained entrance into the blood the victim dies in the course of a few hours to two to three days. It would therefore be next to impossible for the disease to reach the Territory by means of live animals, even though carried on the fastest passenger steamers. The question of how the disease reached the Territory and became epidemic in practically the most remote district on the Island of Kauai is therefore one that is giving the sanitary authorities considerable food for thought. Various theories have been advanced, the principal of which was the possible introduction by means of grass seed imported during recent years from Australia. The plausibility of this theory is refuted by the appearance of the disease in pastures, districts and even other islands, where no imported grass seed was ever planted. Another theory, that the infection might have been introduced by the means of imported bone meal, even though such material may actually have been fed in the salt licks on Hanalei ranch, has failed of proof, although numerous guinea pigs, inoculated with a filtrate prepared from the said licks, offered every opportunity for the demonstration of the possible presence of the infection.

These inoculation experiments were undertaken by the bacteriologist of the local U. S. Marine Hospital Service, Dr. D. H. Currie, and could hardly have failed in the purpose, had the disease been introduced with said bone meal. Besides, a number of outbreaks have since occurred in districts on the islands where no bone meal was ever used, and the question consequently remains an open one to the present day.

Progress of Disease on Kauai and Measures of Control.

As already stated, more than sixty animals were known to have died by the time the diagnosis of anthrax was finally established, that is on April 17. A week before, the manager had called in the Deputy Territorial Veterinarian, Dr. Glaisyer, who had diagnosed the disease as hemorrhagic septicemia, a mistake quite excusable on account of the great similarity of the two diseases, and especially because anthrax was known never to have occurred in the Territory; nor was its introduction considered likely or even possible. That the microscope should have been used sooner is a charge easily made when based on subsequent developments, but the writer doubts whether he would have made a microscopic examination of the blood much earlier himself, as

all the veterinary periodicals from the mainland were overflowing with accounts of the unprecedented losses of cattle from hemorrhagic septicemia while none recorded the appearance of anthrax. The only justifiable charge of negligence would seem to rest with the manager in failing to report such an unusual mortality without delay; and the subsequent losses undoubtedly could have been greatly reduced had measures of control and suppression been instituted a week or even a few days earlier. Not until April 15 did any word reach this office, even though fifty head of cows had died at the time and were still dying faster than they could be buried. As no steamer was due to leave for Kauai before Monday the 16th, the following wireless message was sent to the manager, the impression then being that the disease was hemorrhagic septicemia:

"Parish, Princeville Plantation, Kauai.

"Message today. Two hundred vaccine leave Monday. Nörgaard cannot go. Isolate affected, burn dead, vaccinate all exposed. Write or wire further losses.

"Rice, President Board of Agriculture."

In order to elucidate subsequent developments it is of importance to note the explicit instructions with regard to the disposal of the carcasses by burning.

Meanwhile the writer was busy testing several hundred head of cattle at Kawailoa, Kahuku and Malaeakahana, the Assistant Territorial Veterinarian, Dr. Case, being at the time stationed at Hilo.

On Monday, the 13th, the following message and letter were received from Dr. Glaisyer:

"A. H. Rice,
"Board of Forestry and Agriculture, Honolulu.

"Send 750 doses vaccine. Fifty-five deaths. Vaccine urgently needed. 200 not adequate. Impossible to burn bodies, dying too quickly. Am burying and liming. Six deaths today.

"Glaisyer."

"Hanalei, Kauai, T. H., April 13, 1917.

"Mr. A. H. Rice,
"Chairman, Board of Forestry and Agriculture,
Honolulu, H. I.

"Dear Sir:—I have the honor to submit a brief report of the outbreak of hemorrhagic septicemia on Princeville Plantation to date.

"I arrived last Monday morning, April 9, and found from Mr. Parish, acting manager, that previous to his taking charge of the

ranch, March 22, some seventeen head had died. During the remainder of the month more died, but it was considered that these animals died from the heavy rainfall and not much attention paid to it. They were then moved to a lower paddock, better protected from winds, etc., but the losses did not cease and I was called. Up to this time about 40 or 41 head had died. Monday and Tuesday there was a let-up in the number of deaths but today, April 13, the number has risen to eight, making a total of fifty-eight head. Immediately upon my arrival I posted some recent deaths, and diagnosed hemorrhagic septicemia. After consulting with Mr. Isenberg and Mr. Parish it was considered best to call Dr. Nörgaard. The diseased carcasses had been left lying where they fell, and I immediately had a gang of men put to work burying these carcasses and burning them thoroughly. It is practically impossible to get enough wood to burn them all, quick enough, as there are so many. After burying, the animals are covered with quicklime, then earth, and the ground adjacent thoroughly covered with lime also.

"It is unfortunate that these animals were all skinned, and the hides salted, the carcasses being left to harbor and spread infection. It was then noticed that the pack horses used in carrying these hides caught the disease, and six of them have also died. Two more horses who were with these pack horses steadily have also died, and we think that it was owing to these horses being turned in a paddock with cattle that the secondary infection took place. Also carrying these dripping hides around has contaminated other paddocks.

"The course of the disease has been very short, the animals being found dead in the morning after being well the night before, and dying or being found dead in the afternoon at 4:30 o'clock, when there was not a sick one to be seen on our rounds at 9:30 a. m.

"Until today I have been unable to see a sick animal. In horses the course is longer, generally from two to four days. Two I believe are going to recover. The animals that have died so far (58) with the exception of two have been fat cows and heifers.

"I have quarantined Hanalei district from Waiahole bridge to the foot of the hill at Kalihiwai, and have guards day and night. Two hundred doses of vaccine will not be enough and we should have not less than seven hundred and fifty doses if not more, in case it should break out in other paddocks. I will stay here until the outbreak is pau, but would be very glad to have Dr. Nörgaard come and look things over and give advice. I will make a more detailed report later and will advise number of deaths each mail day.

"Very respectfully,

"A. R. Glaisyer, Dr. M."

On Monday, April 16, the following message was received from Dr. Glaisyer:

"Microscopic examination blood animals dying Hanalei reveals anthrax. Two deaths today. Request Nörgaard come at once. Bring anthrax vaccine instead of vaccine previously ordered.

"Glaisyer."

From the message it appeared that the diagnosis has been made by Dr. Kuhns, who represents the Board of Health in the Kealia district of Kauai.

A cable message ordering 1000 doses of anthrax serum-vaccine was forwarded to San Francisco without delay.

At noon the Legislature representatives for the Island of Kauai had all been apprised of the serious nature of the outbreak and measures were taken at once to secure an appropriation with which to fight the disease. At 5 o'clock the same evening the writer left for Lihue and was, as already stated, enabled to confirm Dr. Kuhns' diagnosis the following day.

While there was a possibility that some of the cattle that had already died might have been suffering from hemorrhagic septicemia, it was decided not to continue with the injection of this vaccine, as it was feared that the rounding up of the cattle might spread the disease further, and after having issued all necessary instructions in regard to the disposal of the dead animals as well as approving of the quarantine already established by Dr. Glaisyer, the writer returned to Honolulu in order to finish up the most pressing business waiting him there. Two days later, however, the writer again left for Kauai to take personal charge of the fight of the disease, it having then been learned that the Legislature would provide the necessary funds for this purpose. The loss from anthrax at that time summed up about as follows:

Previously reported, 55 head, mostly cows dead and buried.
April 13, 8 cows, 1 stallion, 1 horse.
April 14, 3 cows, 1 bull, 2 steers, 2 mules.
April 15, 2 cows.
April 16, 2 cows.
April 17, 4 cows.
April 18, 2 cows.
April 19, 2 cows, 1 mule.
April 20, 3 cows.
April 21, 1 cow, 1 mare.

And until the arrival of the vaccine on April 25 a varying number died each day.

In order to dispose of these carcasses it became necessary to employ a large number of laborers and to hire an auto-truck in order to distribute loads of wood throughout the various pastures where the carcasses were scattered. Two men were then detailed to each carcass with a team of horses with a scraper, to re-

move all the infected sod to a depth of from 4 to 6 inches, which was heaped on top of the places where the carcasses had been burned, and the mound thoroughly sprinkled with a 1 to 100 solution of corrosive sublimate. The graves of the animals which had been buried were located as far away as possible and the same procedure applied to the surface over the graves. A larger amount of sod and dirt would be heaped on top of the graves, in order to prevent the same from sinking after the decomposition of the animal and the forming of a depression, and eventually a pool over the grave.

The serum vaccine was received on April 25, all available chutes having in the meantime been reconstructed for vaccination purposes. From that time on all the animals in the infected pasture were passed through the chute and injected with 10 c. c. anthrax serum on one side of the neck and 1 c. c. anthrax vaccine on the other side, the two injections being made simultaneously by one operator on each side of the chute. Unfortunately strong, cool rains prevailed nearly every night which may have been the cause of the death of a number of the animals following the vaccination. In any case the vaccine failed to stop the loss to the extent which had been hoped for. There can be little doubt that had the vaccine not been applied the rate of mortality would have continued to increase instead of being greatly reduced.

By the end of the month all of the vaccine had been used up and new cases of anthrax had begun to appear in heretofore uninfected districts. On April 30 the total losses were estimated at about 90 head. At this time a second shipment of 1000 doses of serum vaccine was received and it was decided to continue with the vaccination until all animals on the ranch had been treated.

The further history of the outbreak will be dealt with in the May report of this Division.

The following rule and regulation had in the meantime been promulgated by the Board and published in the daily papers of Honolulu and Kauai:

RULE X

Division of Animal Industry.

"Rule and Regulation of the Board of Commissioners of Agriculture and Forestry concerning the quarantine of all domestic animals on the Island of Kauai, on account of Anthrax and Hemorrhagic Septicemia.

"Owing to the fact that disease known as Anthrax or charbon, and Hemorrhagic Septicemia, which affect most classes of domestic animals, and the former of which may be transmitted to man, have made their appearance on the Island of Kauai, it is hereby ordered:

"Section 1. That there is hereby declared a quarantine of the

Island of Kauai, and no domestic or other animal of any class or kind shall be shipped from nor be allowed to leave the Island of Kauai until this quarantine has been lifted by the Board of Agriculture and Forestry.

"Section 2. That the Territorial Veterinarian shall proclaim special quarantine on such sections of the Island of Kauai where these diseases are prevalent. Such special quarantine to be enforced in accordance with the direction of the Territorial Veterinarian.

"Section 3. That it shall be the duty of any person, or persons, whether owner of live stock or not, to report without delay the appearance of any kind of disease among live stock to the Territorial Veterinarian, his assistant or deputy, as well as to assist him in every way to locate, control and suppress any and all cases of the disease in question.

"Section 4. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00), as provided by Section 529, Revised Laws of Hawaii for 1915.

"This rule shall take effect upon its approval by the Governor of Hawaii.

"Approved this 20th day of April, 1917.

"(Signed) Lucius E. Pinkham,
"Governor of Hawaii."

Tuberculosis Control.

The following dairy cattle were tested during the month:

		Total	Passed	Condemned
O. R. R. & L. Co.,	Kawailoa.....	177	177	0
"	Kahuku Ranch .	364	359	5
"	Malaeakahana Ranch	263	263	0
"	Kahuku Ranch .	214	212	2

From the above list it will be seen that a total of 1018 head were tested, out of which number 1011 were passed and tagged, and 7 condemned and branded. The condemned animals were taken to Honouliuli abattoir to be slaughtered.

Sorehead.

During the past month 200 c.c. of chicken pox vaccine was produced in the laboratory, and the following persons were given some: Mr. H. W. Baldwin of Hamakuapoko, Maui, 100 c.c., and Mr. B. P. Zablan of Waianae, Oahu, 100 c. c.

Importations of Live Stock.

S. S. Lurline, San Francisco—6 mules, City Mill Co.; 16 mules, Schuman Carriage Co.; 12 colts, Aubrey Robinson, Makaweli, Kauai; 2 horses, Schuman Carriage Co.; 10 bulls (Hereford), A. & B., Kahului, Maui; 1 horse, A. & B., Kahului, Maui; 1 horse, Mr. Couelho, Kahului, Maui; 5 cts. poultry, J. C. Rent, Kahului, Maui; 5 cts. poultry, Wo Chong.

S. S. Maui, San Francisco—1 dog, "Boston Bull Bitch," Dr. W. T. Monsarrat; 1 dog (bull), Lieut. McNickell; 2 parrots, Mrs. J. H. Raymond; 2 canaries, Mrs. J. H. Raymond.

S. S. Manoa, San Francisco—1 dog, P. R. Isenberg; 1 ct. poultry, Cal. Feed Co.; 1 ct. poultry, F. E. Richardson; 11 cts. poultry, Wo Chong Co.; 5 cts. poultry, J. C. Rent.

S. S. Niagara, Vancouver—1 dog (fox terrier), J. C. Miller.

S. S. Shinyo Maru, Orient—1 dog (Eng. bull), Z. Brudkowski; 6 cts. pheasants, E. H. Paris.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

The First A. R. O. Record Made In Hawaii.

By Ralph J. Borden, *Agriculturist at Kamehameha Schools.*

To the Kamehameha Schools goes the honor of having bred and raised the first dairy cow to qualify for Advanced Registry (the honor class for dairy cows), in the Hawaiian Islands.

The cow which has gained this honor, Jannek Ormsby, is a registered Holstein-Friesian animal, not yet two and a half years old. She is well built, of good size for her age, has a large framework, a strong constitution and a remarkably good digestive system. She was put on official test, under supervision of an official of the College of Hawaii, seven days, after dropping a fine heifer calf, and for seven days was milked at eight-hour intervals, producing 281.2 lbs. of milk containing 8.7 lbs. of butterfat. This is equivalent to 10.9 lbs. of butter. Considering the poor pasturage and the exceptionally lifeless weather at the time the test was made, the production is very satisfactory and this young cow gives promise of developing into an excellent milk-producing animal.

Jannek Ormsby is sired by Prince Ormsby of Sleepy Hollow, a bull secured from California in 1913 and which has since been sold to the Parker Ranch on Hawaii. Her dam, Jannek Pietje Korndyke, is also an imported animal from Iowa, and besides this daughter has produced another daughter and two sons during the four years she has been in Hawaii. She has made 323 lbs. of milk in seven days from three quarters, one quarter having been spoiled by garget several years ago.

During the seven days that Jannek Ormsby was on strictly official test, she consumed the following amount of feed: 7 lbs. bran, 27 lbs. rolled barley, 27 lbs. rolled oats, 38 lbs. Suremilk, 9 lbs. oil cake meal, 36 lbs. beet pulp, 105 lbs. alfalfa hay, and about 100 lbs. of freshly cut green alfalfa. At the then prevailing prices, this feed cost $6.44. The time consumed in grooming, feeding, milking, cooling and bottling the milk and cleaning her stable amounted to about one and one-half hours per day. At twenty-five cents an hour, it cost $2.63 to take care of her, during the test. This made her total cost of feed and labor for seven days, $9.07. She produced 281.2 lbs. or about 131½ quarts of milk. This retailed for twelve cents a quart or for $15.78. This account shows a credit difference of $6.71 between receipts for milk produced and cost of feed and labor. Crediting the animal with the value of her manure and the increase in her own valuation and charging her for a few minor costs like the use of building, wagon, bottles, pails, interest, etc., there is still a neat little sum to show for the week's work.

At the same time that Jannek Ormsby was tested, another purebred registered Holstein-Friesian cow, Duchess Mollie Tritomia, at three and one-half years of age, also qualified for A. R. O., making in seven consecutive days 322.6 lbs. milk containing 10.25 lbs. of butterfat (equivalent to 12.5 lbs. butter). This record was made 33 days after calving, and considering the fact that during the last two days of her test, she refused to eat any grain, the quantities obtained are very good.

This animal was imported from California in 1915. She is of excellent breeding, her pedigree containing a long list of A. R. O. cows. Her dam, also owned by the Kamehameha Schools, has an A. R. O. record of 352 lbs. milk and 14 lbs. butterfat in seven days at three years of age.

Duchess Mollie Tritomia was fed similarly to Jannek Ormsby, receiving but a slightly larger ration, as befitted her larger production. She also has something to her credit when her expenses are deducted from her returns.

Both of these animals which have made the first A. R. O. records in Hawaii will bear watching. They are still young and in excellent health and should they continue as they have begun, they should do much to convince our dairymen of the value of purebred cattle and to increase the popularity of the Holstein-Friesian breed in Hawaii.

BY AUTHORITY.

TERRITORY OF HAWAII

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

RULE XII

DIVISION OF ANIMAL INDUSTRY

Rule and regulation of the Board of Commissioners of Agriculture and Forestry concerning the quarantine of all domestic animals on the Island of Maui, on account of Anthrax and Hemorrhagic Septicemia.

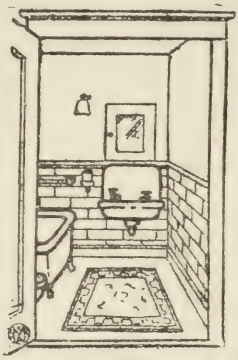
Owing to the fact that diseases known as Anthrax or Charbon, and Hemorrhagic Septicemia, which affect most classes of domestic animals, and the former of which may be transmitted to man, have made their appearance on the Island of Maui, it is hereby ordered:

Section 1. That there is hereby declared a quarantine of the Island of Maui, and no domestic or other animal of any class or kind or their products shall be shipped from or be allowed to leave the Island of Maui until this quarantine has been lifted by the Board of Agriculture and Forestry, or on written permit from said Board.

Section 2. That the Territorial Veterinarian or his deputy shall proclaim special quarantine on such sections of the Island of Maui where these diseases may prevail. Such special quarantine to be enforced in accordance with the direction of the Territorial Veterinarian or his deputy.

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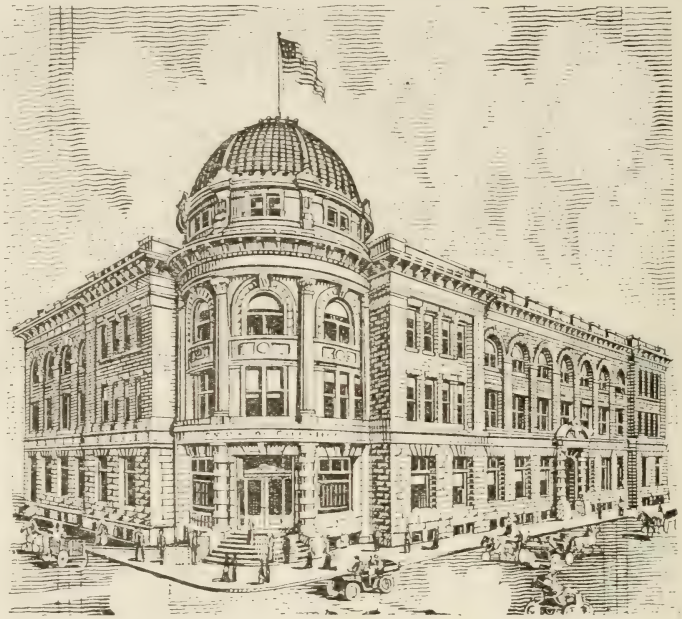
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THE HAWAIIAN FORESTER AND AGRICULTURIST

JULY, 1917

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All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

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THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, JULY, 1917. NO. 7

Professor MacCaughey contributes a short article on the California laurel to this number.

Departmental reports of Forestry, Plant Inspection and Entomology are brought up to May in this issue.

In keeping with the live topic of food conservation is an article in this number on goat's milk for infant feeding. While, as respects some parts of the group, the old saying about the "best Indian" seems to have been applied to goats, yet, given the right kind, a live goat may be much better than a dead one wherever conditions are favorable for keeping that stock.

Preparedness against pests is proving effectual in Hawaii.

HEAD OF FOREST SERVICE NOW IN FRANCE.

Announcement of the arrival of Henry S. Graves, Chief of the U. S. Forest Service, in Paris, has led the Department of Agriculture to explain that Mr. Graves has gone abroad to make arrangements for the forest work which the American army engineers will undertake in France in connection with the military operations of the allied forces.

Because of the opportunity for service by this country in woods work incidental to the war which the request of the British government for the sending of a forest regiment was believed to present, Mr. Graves has been granted leave of absence from his position as head of the Forest Service and has received a commission as major in the Reserve Engineer Corps. He has not been assigned to any command, but is acting under instructions, it is stated, to proceed to France in order to learn on the ground in advance just what conditions will need to be met, what equipment will be called for, and how extensively the service of American lumbermen can be utilized to advantage.

One of the staff officers of the regiment, Captain Barrington Moore, is with Mr. Graves for the purpose of arranging for its prompt assumption of the specific duties to which it will be assigned when it is landed in France. While organized on mili-

tary lines, the work of the regiment will be industrial, not combatant. It will operate in the woods behind the armies, getting out timbers, ties and lumber required for military purposes.

The recruiting of the regiment which has already been asked for is being pushed by the Forest Service and was reported last month to be advancing rapidly. The listing officers for this regiment are as follows: Forest Supervisors Seitz, Erickson, Hastings and Evans, of Oregon; Smith, Fromme, Park and Sylvester, of Washington.

Applicants must be white, between the ages of 18 and 40, and must pass the regular army physical examination. Men subject to conscription will discharge their obligations by enlisting in this regiment.

WHAT THE BIRDS DO FOR US.

Birds interest and cheer us by their action, song and beauty, also they are useful to us in many ways. All animals, including birds, live on what they eat. Birds are so strong and swift and live so fast that they have to eat much more than we. A school teacher undertook to care for and feed a tiny young bird, a little vireo. She fed it 100 grasshoppers in a day. It ate them all, although the legs of the last one stuck out of the little bird's mouth at sunset. Birds love to eat insects such as bugs, caterpillars, moths and beetles.

Insects if not kept in check by the birds and other enemies would increase so fast that they would soon eat every green thing on earth and leave us to starve. Sometimes a single insect lays hundreds of eggs at one time, and in some cases a single pair of insects might produce thousands, or even millions more insects in a year, if they and their eggs were not eaten by birds or destroyed in other ways. Birds spend a large part of their time hunting and killing such insects and their eggs. They eat untold millions of these creatures. In this way they tend to save for our use the vegetables in the garden, the grain in the fields, from which meal and flour are made, and the fruit on the trees, all of which we must have to live and thrive.

Also birds such as sparrows and quail eat the seeds of weeds, and so prevent weeds from growing; other birds, such as hawks, owls and herons kill and eat rats and mice, especially the mice of the fields and woods, which if not so killed off and kept down would increase so fast that they, like the insects, would soon eat up every green thing.

Many birds are scavengers, destroying foul, offensive and decaying things. Others eat flies and mosquitoes, which plague us and carry disease.

Division of Forestry

Honolulu, Hawaii, July 5, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of May, 1917:

Forest Fencing.

Arrangements were completed during the month with the Kukaiau Ranch Company for the construction of a fence on the boundary between the government land of Piha and the private land of Maulua and between the latter land and the government land of Laupahoehoe in the Hilo Forest Reserve, Hawaii. This was authorized on August 4, 1916, but the ranch has not been in a position until recently to undertake the work. A contract provides that the work be completed in five months and the cost of the government's share of work will be $817.90 besides furnishing the fence wire. The total length of fences to be constructed is 4.73 miles and when completed they will put an end to the inroads which wandering cattle have made on the native forest in this region. Mr. H. Meyer, who claims the ownership of these cattle, has been given until June 30 to get rid of them.

Mr. F. G. Snow has completed 1,050 feet of coöperative fencing of the forest reserve strips fronting his place near Glenwood in the Olaa Forest Park Reserve, which were in need of protection, as pointed out in my March report, and is prepared to complete this work in the region of his place.

A short stretch of fence 432 feet in length was constructed during the month on the new boundary of the small area of land next to Lot 817 in the Makiki-Round Top Tract, which was recently eliminated from the Honolulu Watershed Forest Reserve.

On May 23, I visited the region of Makua and ascertained that the fence required by General Lease 730 to be built along the makai boundary of the forest reserve had not yet been constructed. The matter was reported to the Land Commissioner.

Tree Planting:

On the Honolulu Watershed Forest Reserve in upper Manoa Valley 995 koa, 100 silk oak, and 169 various species or a total of 1264 trees were planted, in addition to the necessary weeding to keep previously planted trees from getting choked by the grass.

On Tantalus in an opening in the eucalyptus forest, Ranger Kapihe planted out 80 Australian red cedar trees, *Cedrela australia*.

The tree planting on the Kealia Forest Reserve, Kauai, by Ranger Lovell continued during the month with the planting of 240 silk oak and 122 lemon gum trees.

Assistance was given during the month in two private planting projects in accordance with the customary offer of this Division by supplying seedlings and directions for planting. One of these was on the new Dowsett Tract in Nuuanu Valley, where house lots have recently been placed on the market. Here the Dowsett Company undertook the planting of native koa trees along the paved roads 35 feet apart and 17 feet in from the curb. In all 272 koa trees were thus planted out and in time should form very beautiful and attractive avenues. A windbreak of 109 swamp mahogany trees was also planted at the upper end of the tract.

The other project was at the Oahu Country Club, where advice was given on species to be planted on various parts of the links with methods of planting. Over a dozen hau slips and one hundred willow slips were also actually planted out under our supervision.

Miscellaneous.

One day was spent at the eucalyptus plantation of the Kunia Development Company with the Forest Nurseryman giving advice on forest thinning and in taking growth measurements of trees on sample plots.

The report of hunting on Kahoolawe without a permit was investigated during the month and a strong letter to Edward Tollefsen of Pukoo, Molokai, warning him of the offense and its probable consequences brought forth the reply that he did not know it was unlawful and that he was now acquainted with the rules and regulations. To prevent similar offenses in the future notices have been sent to be posted on Kahoolawe together with copies of Rule II to be handed out by the native boy on the island to all who land there. Incidentally, Mr. Low reported to me on May 15 that while on Kahoolawe recently he had driven 200 goats into the pen, but had released them again.

The bulletin on the ohia lehuas of Hawaii by J. F. Rock was handed to the Honolulu Star-Bulletin for publication.

Maps and description of surveys of several new forest reserves have recently been received from the Government Survey Office and will be presented to the Board before long with appropriate recommendations.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, June 21, 1917.

Superintendent of Forestry,
Honolulu, T. H.

Dear Sir:—I herewith submit a report of the work done during the month of May:

Nursery—Distribution of Plants.

	In Boxes Transplanted	Pot Grown	Total
Sold	52	114	166
Gratis	800	1943	2743
	852	2057	2909

Collections.

Collections on account of plants sold amounted to	$ 3.25
Rent of office building, Nursery Grounds, for March	35.00
Total	$38.25

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 2,000 in seed boxes and 325 pot grown.

Makiki Station.

A 15 H. P. gasoline engine has been installed at the station and everything is practically ready for the cutting up of logs.

The road leading to the station has had some needed repairs and is in a fairly good condition now.

We have now on hand at this station large quantities of the species of trees which are generally in demand, also a number of new exotics which we are experimenting with. For planting on the watersheds we have a large number of koa and other suitable trees ready.

Honolulu Watershed.

During the month the work on the watershed has been principally hoeing and clearing away grass and weeds from the young trees, clearing trails and rooting out seedling Caesalpinia bonduc. A few patches of the latter pest are still to be found in the lower end of Opu Valley.

With the assistance of the squatters who are located in this valley we are spending one day each month in clearing and expect to have it well in hand in a short time.

Advice and Assistance.

The writer has been called upon to give advice and assistance as follows:

Calls made	8
Advice by telephone	10
Advice by letter	4
Advice given to people calling at Nursery	9

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

WHAT SHOULD WE DO FOR OUR FORESTS AND SHADE TREES.

We should plant our waste lands to young trees which will become forests.

We should never set a fire in the woods. If it is necessary to build a fire in the woods it should be made on rocks or bare ground.

Never leave a fire until you are sure it is out.

Never drop a match in the woods.

We should plant shade trees on all our streets and highways.

Every home should have some trees planted near it.

Do not allow anyone to hitch a horse to a shade tree.

Never injure the bark of a tree, it may cause its death.

Spray the trees to kill their insect enemies.

Water the trees in hot dry weather.

Learn to love and protect the trees for they are among our best friends.

In coöperation with the food supply committee of the California state council for defense, the U. S. Forest Service is making plans to stock to their very fullest capacity the national forest ranges. If the stock can be secured and the money raised for necessary trails and water developments, an increase in the number on the ranges equivalent to 80,000 head of cattle might be made.

Division of Plant Inspection

Honolulu, Hawaii, May 31, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of May, 1917, as follows:

During the month there arrived at the port of Honolulu 59 vessels, of which 27 carried vegetable matter. Of these vessels 2 passed through the Canal Zone in transit to the Orient.

Disposal	*Lots*	*Parcels*
Passed as free from pests	830	15,194
Fumigated	26	92
Burned	113	119
Returned	5	5
Total inspected	974	15,410

Of these shipments 14,907 packages arrived as freight, 268 packages as mail matter and 235 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 68,488 bags of rice and 4184 bags of beans arrived from Japan and Oriental ports, and after careful inspection were passed as free from pests.

Pests Intercepted.

Approximately 7377 pieces of foreign baggage belonging to passengers and immigrants were examined and 68 packages of fruit and 40 packages of vegetables were seized and destroyed by burning.

On May 5th, a passenger from Manila brought 30 orchids and two ornamental trees, with permit to import. These were fumigated and one orchid showing decay was destroyed.

On May 3rd, shipments of plants from California were fumigated on account of being infested with plantlice and ants.

On May 9th, 2 baskets of garlic in the cargo of the S. S. China were found infested with the larvae of a Lepidopteron, probably *Ephestia clutella,* and were fumigated with carbon bisulphide before delivery.

On May 15th, 4 cases of rose plants arrived from San Francisco, and were fumigated on account of rose aphis. On the same date the S. S. Colombia brought 30 Lichee trees and 18 Bamboo suckers which belong to the U. S. Department of Agriculture, Washington, D. C. Mr. Groff, who had charge of these plants, found that they would not stand the long journey and asked permission to turn them over to the local Experiment Station. The Collector of Customs and I saw no objection to this request, and after the usual fumigation and removal of packing and soil they were turned over to Mr. Higgins. In the packing were found a few snails, slugs and a colony of ants; the plants were free from pest or disease.

The following plants were taken from the baggage of passengers and immigrants:

One Peony from Japan, May 9th, which was burned; one Juniper and one Wistaria from Japan May 19th, which were returned on board the steamer; one ornamental plant from China, May 31st, which was burned, and one Wisteria from Japan which was burned.

The following packages were found in the post office:

One package of seeds from Manila for the Board of Agriculture and Forestry, which was fumigated with carbon bisulphide as a precaution.

Two packages of corn from Japan which were contraband and were returned by the postmaster, as well as a package of tree seeds.

One package of tree seeds from New Zealand for the Forester of the Board of Agriculture and Forestry, which was first fumigated as a precaution.

On May 5th, 3 packages, and on May 31st 2 packages of beneficial insects arrived for the H. S. P. A. and were handled in the usual way. All soil and packing has been destroyed.

Six Queenbees from California having the proper certificate were allowed to land.

Hilo Inspection.

Brother Matthias Newell reports the arrival of seven steamers, of which four brought vegetable matter, consisting of 126 lots and 1996 packages of fruits and vegetables. All were passed as free from pests.

Kahului Inspection.

Mr. Will J. Cooper reports the arrival of nine vessels, three of which brought vegetable matter, consisting of 12 lots and 417 packages of fruits and vegetables. One crate of turnips showed infestation of the turnip maggot and was ordered dumped at sea. All other shipments were free from pests and were passed.

Inter-Island Inspection.

Sixty-two steamers plying between Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	511	bags
Vegetables	180	packages
Plants	130	"
Fruit	11	"
Total Passed	832	"

The following packages were seized and refused shipment on account of not meeting the required regulations pertaining to soil and infestation:

Fruit	4	packages
Plants	6	"
Total Refused	10	"

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, Hawaii, June 6, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—During the month of May the insectary handled 33,800 pupae of the melon fly. From these there were bred 950 females and 731 males, *Opius fletcheri.*

The distribution of parasites was as follows:

Opius fletcheri.

	Females	Males
Oahu—		
Sheridan Street	492	430
Kaimuki	45	15
Waianae	60	30
Castner	140	120
Maui—		
Haiku	105	80
Kauai—		
Homestead	60	30

Opius humilis.

Oahu—		
Kaimuki	35	25

Diachasma tryoni.

Kaimuki	55	20

Diachasma fullawayi.

Kaimuki	30	15

Tetrastichus.

King Street 2000

Pamanagrus (Corn leaf hopper parasite).

Makiki	300
Sheridan Street	2000
Nuuanu	550
Manoa	25
Kailua	600
Kauai—	
Kilauea	400
Lihue	2550
Molokai	1500
Lanai	900
Maui—	
Haiku	1400
Makawao and Kula	3400

Respectfully submitted,

D. T. Fullaway,
Entomologilst.

Goat's Milk for Infant Feeding

The following is the "summary" of Bulletin No. 429 of New York Agricultural Experiment Station, Geneva, N. Y., the authors of the bulletin being W. H. Jordan and G. A. Smith:

1. During the years 1910-1912, inclusive, a herd of milch goats was kept at the Station. The number of animals of which complete records were kept varied from 10 to 26.

2. In the year 1912, 31 adult and 9 partially grown animals were fed. The quantity of food consumed was as follows:

Dry, coarse food	37,740 lbs.
Beets	1,550 "
Cut grass	24,000 "
Pasture	132 days
Grain	14,688 lbs.

3. The total cost of this food, at the prices then ruling, was $441.95. The average cost per month per goat varied from $0.481 to $0.992. The average cost of food per goat per year was $11.05, making the daily cost $0.03.

4. The yearly production of milk, including some animals in the first period of lactation, varied from 301.7 pounds to 1,845.2 pounds. The average yearly yield for 10 animals of which records were kept during 3 years, including 28 lactation periods, was 800.4 pounds.

5. The food cost of the milk per goat for all the goats during the year 1912 was 4 cents per quart and for the three years during which the record was kept 3.4 cents. The lowest cost was with the Saanen goat, No. 11, for the year 1911, which was estimated to be 1.27 cents per quart. The other items of cost, such as care and overhead charges, it is not possible to give with any accuracy. The average food cost for a quart of milk from the Station herd of 25 Jerseys during the three years has been found to be .92 cent per quart.

6. The range of composition of the mixed milk of the whole flock as determined during May and June of the year 1912 was as follows: Solids, 11.4 per ct. to 11.9 per ct.; solids not fat, 7.72 per ct. to 8.61 per ct.; fat, 3.5 per ct. to 3.8 per ct.

The composition of milk from individual goats was found to vary in total solids from 9.22 per ct. to 18.55 per ct.; in protein, from 2.24 per ct. to 4.96 per ct.; in casein, from 1.56 per ct. to 4.6 per ct.; in fat, from 1.08 per ct. to 8.4 per ct.; and in ash, from 0.43 per ct. to 0.8 per ct.

7. A chemical study of the goat's milk indicated no essential difference between the constitution of its casein and that of cow's

milk. Marked and probably important differences were observed in the salts of the ash as compared with the ash of both cow's milk and human milk.

8. Extensive study of the use of goat's milk in infant feeding by Doctors Sherman and Lohnes, of Buffalo, showed that the curds of goat's milk when returned from the stomach were smaller and more flocculent than those of cow's milk. From the determination of the combined hydrochloric acid in the returned food, the authors conclude that the cow's milk had a greater stimulating effect on the stomach than goat's milk. The absorption of the food and gain in weight in comparing the two milks were indefinite for several reasons. The babies tolerated equally well similar amounts of goat's milk and cow's milk when used with the same diluents. The younger the child, the more the evidence pointed toward a greater gain on goat's milk.

9. Goat's milk was supplied to 18 cases of children that were not thriving on any other food that had been tried. In 17 cases a satisfactory state of nutrition was established through the use of goat's milk, the beneficial results in some instances being very marked. With certain of these children their situation was regarded as serious, and their restoration to a satisfactory nutritional condition was good evidence that goat's milk is often a very desirable resort for infant feeding.

The California Laurel

By Vaughan MacCaughey,

Professor of Botany, College of Hawaii.

In response to a request recently received at the College of Hawaii concerning the wood of the California Laurel, the following data was prepared. As this wood is one of the most valuable cabinet woods of Hawaii's chief source of lumber, and as it is practically unknown in the Territory of Hawaii, the information given below may be of general interest.

The California Laurel is a member of the Laurel family, which includes such trees as the Alligator Pear, Camphor, Cinnamon and Sassafras. Its technical name is *Umbellularia californica* Nuttall; the generic name refers to the flower clusters, which are little umbels. It is also known as Spice Tree, Pepper-wood and "Oregon Myrtle."

It is a tree of average size, under favorable conditions, however, attaining a height of 80-90 feet. Trees 100 feet high have been recorded. It is sometimes tall and straight, but usually divided near the ground into several large diverging stems. At high elevation (4000 feet) and in Southern California it is small and is very frequently only a shrub. Jepson describes six forms: typical, gregarious, pendulous, rockpile, dwarf and prostrate. The last occurs along the sea-coasts.

Its range extends along the Pacific Coast from Oregon to Southern California; it is common where it can obtain an abundant supply of water. It is most common and of its largest size in the rich valleys of Southwestern Oregon, where it forms, with the broad-leaved Maple, a considerable part of the forest growth.

All parts of the tree are characterized by an aromatic, pungent, volatile oil of spicy flavor and odor. The wood is the most valuable timber produced in the forest of the Pacific North America for the interior finish of houses and for furniture. It is heavy, hard, strong, compact, close-grained. The heartwood is light rich brown; the sapwood is lighter in color, thick, comprising 30-40 layers of annual growth. The ducts (sap-tubes) are fine and evenly distributed; the medullary rays are numerous and delicate. The wood takes a high polish; in manufacture it is used for turned articles and is especially valued for furniture and interior finish. For these latter purposes no other Pacific Coast wood furnishes such luxurious patterns. The beautiful "Black Myrtle" of Oregon is produced by sinking logs in water to improve the color of the wood.

The physical properties of the wood, according to Hough, are as follows:

Specific gravity	0.6517
Percentage of ash	0.39
Relative approximate fuel value	0.6492
Coefficient of elasticity	106766
Modulus of rupture	806
Resistance to longitudinal pressure	568
Resistance to indentation	199
Weight per cubic foot	40.61 lbs.

No specimens of the tree are known in the Hawaiian Islands, and the wood does not occur in the local trade.

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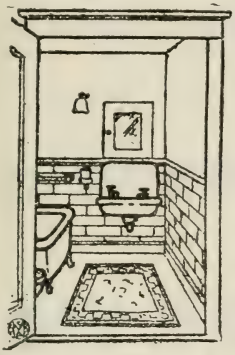
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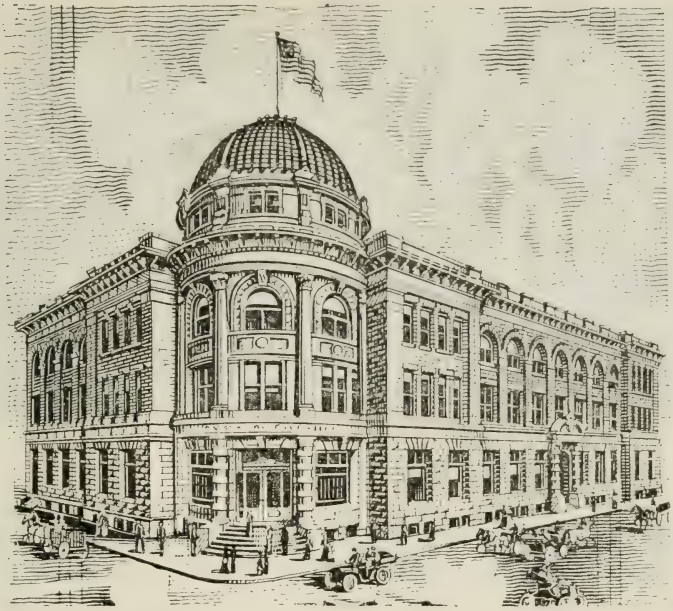
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THE HAWAIIAN FORESTER AND AGRICULTURIST

AUGUST, 1917

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C. S. JUDD,
Superintendent of Forestry.

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Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, AUGUST, 1917. NO. 8

Division of Forestry

Honolulu, August 18, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu,

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of June, 1917:

Forest Planting.

In upper Manoa valley on the Honolulu Watershed forest reserve there were planted out during the month on government land 995 koa trees on the mountainous slopes and 100 silk oak and 169 Benguet pine trees on the flatter areas, making a total of 1264 trees.

Hauula Reserve.

During the month I spent three days at Hauula, Oahu, with two government surveyors in the work of surveying out and marking on the ground the boundary of the proposed Hauula forest reserve which will embrace about 1000 acres of native forest. At the same time I conferred with the homesteaders and received from them the assurance that within one month, when present road work was completed, they would begin the work of erecting a fence on this line to prevent their cattle from getting mauka.

Forest Fire.

On June 25 I was informed by Fire Warden Wilson that there was a forest fire on the military reservation near Wahiawa and immediately went down. I found that the fire was on the Koolau range side on the land of Waianae-uka and had started at about 11 o'clock that morning. Two troops of the 4th Cavalry and 90 prisoners were fighting the fire efficiently and before nightfall had it completely subjugated. About 50 acres of mostly

grass land and ferns were burned over and a few clumps of trees destroyed.

Personnel.

It is with regret that I announce the death from consumption on June 20 of Forest Ranger Kaina D. Lovell. He was a faithful worker and did efficient work in his district on Kauai.

On June 20, Forest Ranger Francis B. Dodge for the Island of Hawaii severed his connection so that he could enlist in the navy. I have since been attempting to find an efficient man to take his place and hope before long to secure one capable of filling the position.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

FOREST NURSERYMAN'S REPORT.

Honolulu, August 20, 1917.

Superintendent of Forestry,
Honolulu, T. H.

Dear Sir:—I herewith submit a report of the work done during the month of June:

Nursery.—Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold		50	259	309
Gratis	1000	750	2274	4024
	1000	800	2533	4333

Collections.

Government Realizations.

Sale of plants	$ 6.20
Rent of office building, Nursery grounds	35.00
	$41.20

Preservation Forest Reserves.

Collections for quarter ending June 20:

Rent of premises at Half Way House, Tantalus	$30.00
Fee for use of land and gathering leaves	12.50
58 loads of black sand from Makiki sand pit	14.50
	$57.00

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 200 in transplant boxes and 250 pot grown, total 450.

Makiki Station.

The work at this station was principally routine, consisting of mixing and sterilizing soil, transplanting and potting plants.

Honolulu Watershed Planting.

The area upon which the Caesalpinia bonduc had taken possession, and which we cleared off about a year ago, was all gone over and the seedlings and a few remaining root shoots dug up and destroyed. The Caesalpinia bonduc in Opu valley is gradually being routed out. With the aid of the squatters in that section one day each month assisted by our men, this pest will soon be eradicated from this part of the preserve.

Advice and Assistance.

The writer has been called upon to make visits and give advice and assistance as follows: Visits made 8, telephone advice 10, letter advice 4, advice given at Nursery 6.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

REPORT FOR JULY.

Honolulu, August 20, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of July, 1917.

My work as Executive Officer in connection with anthrax control, preparing the budget and reports, and attending meetings kept me rather closely confined to Honolulu during the month, but I was able to get away from the office twice.

Field Trips.

One day was spent with Consulting Botanist J. F. Rock in the region of Leilehua and Waialua, Oahu, looking up rare native trees of botanical interest and in obtaining a general idea of the

condition of the land from the viewpoint of the danger of grass and forest fires.

On another day I went with Mr. Dean of the Food Commission and Mr. Louis Warren to Nanakuli valley to look into the question of grazing on forest reserve lands, and reached the conclusion that the native forest should be protected from all stock.

Forest Planting.

The tree planting in upper Manoa valley during the month consisted of 1032 koa trees and 400 silk oak trees or a total of 1432 trees set out on government land within the Honolulu Watershed forest reserve.

Rule IV.

Rule IV of this Division was passed by the Board on July 20 and approved by the Governor on July 28. It provides for the protection of bird, animal and vegetable life on six small islands off the windward coast of Oahu and one island off the eastern end of Molokai, in accordance with the authority conferred on this Board by Act 214 of the Session Laws of 1917. For the enforcement of this rule on the islands off Oahu the board on July 20 appointed Mr. Bruce Cartwright, Jr., as Honorary Forest Ranger. It is planned to have suitable and permanent signs painted in the English, Hawaiian and Japanese language, calling attention to this rule, placed on each of these islands.

Fire Warnings.

On account of the dry conditions on several parts of the islands a new supply of cloth forest fire warning notices was printed and distributed to district fire wardens for posting in regions where there is danger of the starting of grass and forest fires.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

FOREST NURSERYMAN'S REPORT.

Honolulu, August 20, 1917.

Superintendent of Forestry,
Honolulu, T. H.

Dear Sir:—I herewith submit a report for the month of July:

Nursery—Distribution of Plants.

Sold, pot-grown plants	67
Gratis, pot-grown plants	1869
Total	2081

Collections.

Collections on account of plants sold amounted to.....$ 1.55
Rent of office buildings, Nursery grounds, for May..... 35.00

. Total.....$36.55

Plantation Companies and Other Corporations.

Distribution of plants amounted to 100 pot grown. We have received orders for 40,000 seedlings to be delivered when ready. We will be able to fill those orders within the next few weeks.

Makiki Station.

The shed at this station had to be enlarged and strengthened to carry the pulleys and shafting for the two saws and benches. Those have been tried and found to work well. A start will be made soon to cut up wood for seed boxes, laths, etc.

Honolulu Watershed Planting.

As the dry season is again on, the clearing of trails as a precaution against fire is necessary. Half of the month was devoted to clearing trails and the other half to hoeing the trees lately planted. We expect to finish the clearing of all the trails about the middle of August, when we will be able to again start making holes for more trees.

Advice and Assistance.

The writer has at the request of people in and around the city made calls and given advice and assistance as follows: Calls made 6, advice by telephone 8, advice by letter 4, advice to people calling at Nursery 10.

Very respectfully,

David Haughs,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, June 30, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of June, 1917, as follows:

During the month there arrived at the port of Honolulu 39 vessels of which 20 carried vegetable matter.

Disposal	Lots	Parcels
Passed as free from pests	647	11,165
Fumigated	6	1,410
Burned	32	32
Returned	1	4
Total inspected	686	12,611

Of these shipments 12,312 packages arrived as freight, 106 packages as mail matter and 193 packages as baggage of passengers and immigrants.

Rice, Bean and Grain Shipments.

During the month 9410 bags of rice and 825 bags of beans arrived from Japan and other Oriental ports and were released when found free from pests. There arrived also 1200 bags of wheat from Japan which had been shipped by direct steamer to Hilo for transhipment to Honolulu, probably owing to freight congestion. This wheat was infested with the grain weevil and had to be fumigated with carbon-bisulphide before delivery was permitted.

Pests Intercepted.

Approximately 2733 pieces of foreign baggage belonging to passengers and immigrants were examined and from the same were seized and destroyed by burning 22 packages of fruit and 9 packages of vegetables.

On June 2, four ornamental plants arriving on the cruiser Yakuma were returned on board as contraband.

On June 8, one package of lily plants was brought by a passenger and was fumigated as a precaution and all soil removed. Another lot found in the baggage, consisting of six plants and two lily bulbs, was treated the same way.

On June 10 a shipment of plants arrived from Manila, consist-

ing of 191 orchids. These were overhauled, all soil removed and fumigated on account of finding a few scale insects.

On June 16 a passenger brought a box with 10 plants. All soil was removed and the plants were fumigated. Among them was an orange tree, which, under Notice of Quarantine No. 19 of the Federal Horticultural Board, is prohibited from entry, and was seized and burned.

On June 19 one case of orchids arrived from England. The plants showed some slight infestation of palm aphis and were fumigated before delivery.

Hilo Inspection.

Brother Matthias Newell reports the arrival of nine steamers, of which five carried vegetable matter, consisting of 210 lots and 2013 packages of fruits and vegetables. All being free from pests, they were passed for delivery.

During the month the Japanese steamer Seiyo Maru arrived direct from Japan with 4852 bags of rice, 263 bags of beans, 2 bags sesame seed, and 3 bags of peanuts for Hilo, and 1200 bags of wheat for Honolulu. This wheat was shipped to Honolulu by the Inter-Island boat and was found badly infested with the grain weevil and was ordered fumigated for 48 hours with carbon bisulphide.

Brother Newell took his usual vacation during the month, and Mr. D. B. Kuhns was sent to Hilo to attend to the inspection work during his absence.

Kahului Inspection.

Mr. Will J. Cooper reports the arrival of seven steamers, three of which brought vegetable matter, consisting of 24 lots and 601 packages. All of the shipments were passed as free from pests except four crates of turnips, which were infested with the radish maggot and were refused a landing and ordered destroyed.

Inter-Island Inspection.

Fifty-eight steamers plying between Honolulu and other Island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	654 bags
Plants	184 boxes
Vegetables	173 boxes
Fruit	17 boxes
Total passed	1028 packages

The following packages were seized and refused shipment on account of not meeting the required regulations pertaining to soil and infestation:

Plants	6 packages
Fruit	5 packages
Total refused	11 packages

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

REPORT FOR JULY.

Honolulu, July 31, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of July, 1917, as follows:

During the month there arrived at the port of Honolulu 51 vessels, of which 26 carried vegetable matter, and two of these passed through the Canal Zone in transit to the Orient.

Disposal.	Lots.	Parcels.
Passed as free from pests	1,222	17,381
Burned	58	59
Fumigated	6	146
Returned	1	1
Total inspected	1,287	17,587

Of these shipments, 17,220 packages arrived as freight, 96 packages as mail matter and 271 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 28,239 bags of rice and 3608 bags of beans arrived from Japan and the Orient, and all but 100 bags of Japanese rice were passed as free from pests; the 100 bags were fumigated with carbon-bisulphide before delivery, as they were infested with the rice moth, *Paralipsa modesta.*

Pests Intercepted.

Approximately 4989 pieces of foreign baggage belonging to passengers and immigrants from foreign countries were exam-

ined and from the same were seized and destroyed by burning 20 packages of fruit and 38 packages of vegetables.

On July 2, ten small plants were found in the baggage of a passenger from Japan and were fumigated before delivery; all the soil was removed.

On July 12 a package of tree seeds was found in the baggage of a passenger from China, and these, showing infestation, were seized and destroyed.

On July 17 a package of tree ferns was found in the baggage of a passenger from Australia, and being free from pests was allowed to land.

On July 25 a box of orchids arrived by freight from Manila and was fumigated as a precaution.

The following packages came by mail:

On July 12, one package of corn from Japan, which being contraband was returned to the shipper.

On July 18, four packages of tree seed from Ceylon for Mr. J. F. Rock. These were fumigated before delivery.

On July 18, a box of coffee samples for the Hawaii Experiment Station from Java was treated to fumes of formaldehyde as a precaution.

On July 25, one package of palm seeds from Singapore for Mr. J. F. Rock, which was fumigated with carbon-bisulphide before delivery.

Hilo Inspection.

Brother Matthias Newell reports the arrival of three steamers and one sailing vessel carrying vegetable matter, consisting of 214 lots and 2167 packages. All were found free from pests and were passed for delivery.

Kahului Inspection.

Mr. Will J. Cooper reports the arrival of seven steamers, two of which brought vegetable matter, consisting of 16 lots and 469 packages of fruits and vegetables. Four boxes of infested turnips were condemned and ordered dumped at sea. The rest of the shipments were passed as free from pests.

Inter-Island Inspection.

Sixty-four steamers plying between Honolulu and other Island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	488 packages
Vegetables	207 packages
Plants	103 packages
Fruit	26 packages
Total inspected	824 packages

Four packages of plants and three packages of fruit were seized and refused shipment on account of infestation and undesirable soil.

Respectfully submitted,

E. M. EHRHORN,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, July 16, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—During the month of June the insectary handled 26,200 pupae of the melon fly. From these there were bred 630 females and 553 males, *Opius fletcheri.*

The distribution of parasites was as follows:

Opius fletcheri.

	Females.	Males.
Oahu:		
Sheridan Street	456	376
Kaimuki	75	30
Maui:		
Wailuku	128	116

Diachasma tryoni.

Oahu:		
Honolulu	30	25
Maui:		
Wailuku	50	20
Paia	50	20

Proctotrupid.

Oahu:		
Nuuanu Valley	35	50

Chalcid.

Nuuanu Valley, Oahu	20	25

Tetrastichus.

King Street, Honolulu, Oahu	500

Paranagrus (corn leaf hopper parasite).

Oahu:	
Makiki	150
King Street	1200
Manoa	900
Waipio	250
Kauai:	
Kilauea	600
Kapaa	1050
Molokai:	
Pukoo	1100

Respectfully submitted,

D. T. Fullaway,
Entomologist.

REPORT FOR JULY.

Honolulu, August 14, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—During the month of July the insectary handled 28,200 pupae of the melon fly, from which emerged 612 females and 556 males, *Opius fletcheri*. The distribution of this parasite was as follows:

Opius fletcheri.

	Females.	Males.
Oahu:		
Honolulu—		
Sheridan Street	400	320
Moanalua	140	145
Kaimuki	35	30
Maui:		
Wailuku	100	80

The following fruit and horn-fly parasites were also distributed:

Diachasma tryoni.

	Females.	Males.
Oahu:		
Kaimuki	25	15
Nuuanu	15	20

Tetrastichus.

Oahu:	
Kaimuki	250
Nuuanu	100

	Females.	Males.
Galesus.		
Pauoa, Oahu	50	100
Chalcid.		
Pauoa, Oahu	40	65

Corn Leaf-hopper Egg Parasite.

Oahu:	
Corn field, King and Piikoi Streets	700
Corn field, Young Street	1100
Manoa Valley	1750
Makiki Nursery	1300
Molokai:	
G. F. Brown	200
Kauai:	
Karl Jensen	700
Maui:	
Edward Shim	1500

Very respectfully,

DAVID FULLAWAY,
Entomologist.

Division of Animal Industry

Honolulu, August 17, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I have the honor to submit the following report on the work of the Division of Animal Industry for the month of May, 1917:

Outbreak of Anthrax on Kauai.

The history of this outbreak previous to my arrival, May 2, appears in the report for April. Up to this time the total estimated loss was 97 head, and there had been vaccinated a total of 889 head by Drs. Nörgaard, Glaisyer and Fitzgerald.

I arrived at Nawiliwili, Kauai, on the morning of May 2, to assist Dr. Glaisyer in the control of the outbreak, Dr. Nörgaard returning to Honolulu suffering from inoculation with anthrax received during a post-mortem examination. Vaccination of the remaining animals on the ranch was started May 3.

Number of Animals Vaccinated and Method Used.

Muldord's double vaccine.....913 head
Muldord's simultaneous vaccine.....678 head
Cutter's double vaccine.....298 head
Cutter's single vaccine..... 51 head

A total of 1940 animals were vaccinated during the month.

The number of deaths during the past month, taking it by paddocks and districts, is as follows:

Kawa mauka paddock..12 cows, 4 steers, 1 calf, 1 horse.
Kawa makai paddock...None.
Nihupohaku paddock...None.
Mauna Kaliko paddock. 4 cows, 4 calves.
Wanini paddock..... 1 cow.
Hanapai paddock.....None.
No. I paddock.....1 steer, 7 cows, 1 calf.
No. II paddock.....5 cows, 2 steers.
No. III paddock.....7 cows, 3 steers.
Beef paddock.....None.
Stables.....1 mule, 1 jack, 1 horse.
Kalihiwai District.....1 colt.
Kalihikai District..... None.

From the above list it will be seen that there was a total of 56

deaths from anthrax during the month, the larger portion being unvaccinated animals.

Varying lengths of time after vaccination certain animals would develop localized swellings of the throat, neck, brisket and lower part of the abdomen. These cases were given anti-anthrax serum subcutaneously in doses varying from 50 cc to 100 cc. Six such cases occurred during the month, 3 horses, 2 cows and 1 mule, all making complete recoveries, the swellings disappearing in from two to three days. Muldord's serum was used in these cases.

All animals dead from whatever cause within the quarantined area were cremated on the spot. Autopsy was only resorted to in those cases where there was doubt as to the cause of death. Microscopical examinations were made in every case.

Anthrax on Oahu.

On May 24, Dr. Nörgaard was called to Mr. T. F. Farm's dairy to perform an autopsy on a year-old heifer which had died the night before. On the results of this examination a diagnosis of hemorrhagic septicemia was made. Later on the same day a young grade Holstein bull was found dead, autopsy of which followed by microscope examination revealed anthrax. This diagnosis was substantiated by Dr. Currie of the U. S. Marine Hospital Service.

Immediately thereafter Farm was notified by Dr. Nörgaard and Dr. J. T. Wayson that his dairy was quarantined, and that no more milk could be sold, and the following rule quarantining the Island of Oahu, and further quarantining the particular district in which Farm's dairy was located, was promulgated by the Board and published in the daily papers:

"Rule XI.

"Division of Animal Industry.

"Rule and Regulation of Commissioners of Agriculture and Forestry concerning the quarantine of all domestic animals on the Island of Oahu, on account of anthrax and hemorrhagic septicemia.

"Owing to the fact that the diseases known as anthrax or charbon, and hemorrhagic septicemia, which affect most classes of domestic animals and the former of which may be transmitted to man, have made their appearance on the Island of Oahu, it is hereby ordered:

"Sec. 1. That there is hereby declared a quarantine of the Island of Oahu, and no domestic or other animal of any class or kind shall be shipped from or be allowed to leave the Island of Oahu until this quarantine has been lifted by the Board of Agriculture and Forestry, except on a written permit from said Board.

"Sec. 2. That there is hereby declared a further quarantine of the area bounded by the following streets and lanes in the District of Honolulu, City and County of Honolulu, Island of Oahu; beginning at the northeast corner of Beretania and Artesian streets, thence along the east side of Artesian street, thence along the south side of Bingham street, thence across Metcalf street and along the northern side of Metcalf street as far as the College of Hawaii grounds, thence across Metcalf street and along the eastern side of the lane leading from Metcalf street at the entrance to the College of Hawaii grounds, in an easterly and southerly direction past the Moiliili rock quarry to Beretania street near the junction of King and Beretania streets, thence along the northern side of Beretania street to the point of beginning. No domestic or other animal of any class or kind shall be allowed to enter and /or leave the above described district until further notice from the Board of Agriculture and Forestry.

"Sec. 3.—That the moving or transfer of any dairy animal from one dairy to another or from one pasture to another within the Honolulu district, from Maunalua to Moanalua, is prohibited until further notice from the Board of Agriculture and Forestry.

"Sec. 4. That it shall be the duty of any person or persons, whether owner of live stock or not, to report without delay the appearance of any kind of disease among live stock to the Territorial Veterinarian, his assistant, or deputy, as well as to assist him in every way to locate, control and suppress any and all cases of the diseases in question.

"Sec. 5. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed five hundred dollars ($500.00), as provided by Sec. 529, Revised Laws of Hawaii of 1915.

"This rule shall take effect upon its approval by the Governor of Hawaii.

"Approved this 25th day of May, 1917.

(Signed) "LUCIUS E. PINKHAM,
"Governor of Hawaii.

"Honolulu, Territory of Hawaii."

I was summoned by wireless from Kauai and left immediately with vaccine sufficient to vaccinate the remaining Farm animals and whatever dairies were included in the quarantined area.

Arriving in Honolulu the morning of May 26, I went immediately to the quarantined district where Dr. Nörgaard, assisted by myself, vaccinated the following animals:

T. F. Farm Dairy: 90 cows, 19 heifers, 2 bulls, 13 horses.

P. Miyakawa Dairy: 9 cows, 1 bull, 3 heifers, 2 horses.

K. Inouye Dairy: 40 cows, 6 heifers, 2 bulls, 4 horses.

Also 23 hogs and 24 young pigs were vaccinated with hemorrhagic septicemia vaccine at M. Ishikawa's piggery, which was within the quarantined area.

Following the vaccination, 2 cows and 2 calves died at the Farm dairy, having become infected before the vaccine was administered. Since then no more have died, but, considering the experience on Kauai, a few more may possibly succumb to the disease.

All efforts were made to trace the source of the outbreak; all imported feeds used by Mr. Farm were analyzed by experts connected with the U. S. Marine Hospital Service without disclosing anything of a significant nature.

Tuberculosis Control.

The following cattle were injected during the past month:

	Tested.	Passed.	Condemned.
M. K. Young.....	1	1	0
Capt. M. L. Heartman....	4	4	0

From the above list it will be seen that a total of 5 head of dairy cattle were tested, all of which passed and were tagged in the usual manner.

Importations of Live Stock.

S. S. Wilhelmina, San Francisco: 1 dog, Miss F. Bishop; 1 ct. doves, W. F. X. Co.

S. S. Lurline, San Francisco: 30 mules, U. S. Q. M. Department; 1 horse, U. S. Q. M. Department; 24 mules, Schuman Carriage Co.; 20 mules, Maui Agricultural Company; 1 cow, L. C. Clark; 17 cts. poultry.

S. S. Maui, San Francisco: 1 dog, Mrs. Shotz; 1 ct. chix, W. F. X. Company; 1 ct. guinea pigs, Mr. M. F. Flood.

S. S. Randjaini, Yokohama: 1 dog, B. Maruse.

S. S. Manoa, San Francisco: 14 cts. poultry; 1 alligator, 1 ct. porcupines, M. Perreira.

S. S. Ventura, San Francisco: 1 cat, Chas. Houston.

S. S. Matsonia, San Francisco: 1 ct. poultry, W. F. X. Co.

S. S. Niagara, Sydney: 2 gnu, Ben Hollinger.

S. S. Siberia, Orient: 1 dog, Mrs. Thomas.

Respectfully submitted,

Leonard N. Case,
Assistant Territorial Veterinarian.

REPORT FOR JUNE.

Honolulu, August 18, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit the following report for the month of June, 1917:

Anthrax Situation on Kauai.

On June 5, I again left Honolulu for Kauai, this time to assume complete charge of the anthrax control work on that island. A more strict quarantine was inaugurated, two more guards being employed and stationed on the beach just makai of Mr. Makee's house, to prevent animals passing into and out of the quarantined area. The following notice was placed in the Garden Island:

IMPORTANT.

Notice is hereby given that from now on all persons passing into or through the quarantined area of Hanalei district will be stopped by the guards at Kalihiwai and Waiole.

No dogs will be allowed into or through the quarantined district. All vegetables of whatever nature grown within the quarantined district will not be allowed to be sold outside. Vegetables grown outside the quarantined area intended to be taken into or through Hanalei will be allowed to pass; the guard at one station issuing a pass to the driver of automobile or truck, said pass to be taken up by the guard at the other station.

Per order of

DR. LEONARD N. CASE,
Assistant Territorial Veterinarian, Board of Agriculture and Forestry.

The above notice had a very beneficial effect and was much appreciated by residents in other parts of the island.

A twelve-hour notice was given all dog owners in the quarantined district and the district of Kilauea to have their dogs confined in such a manner that they could not get loose. At the end of that period a patrol with a gun was put on, who covered the entire quarantined area and who was instructed to shoot on sight all stray and ownerless dogs. By this means, together with a little poison, about fifty useless dogs were gotten rid of and the danger of the spread of the disease by this means greatly lessened.

Rule X was printed on cardboard similar to that used by the Board of Health in their notices, and posted in every conspicuous place throughout the island in order to bring it fully to the attention of all. Also, two large signs were made, painted white and bearing the legend, "QUARANTINE DISTRICT; STOP HERE," painted in large black letters, and placed at Kalihiwai and at Waiole, in order to warn people of their approach to the quarantined area.

During the month a total of 78 head of cattle were vaccinated, using the Cutter's double vaccine. This finished the injection; all animals included within the quarantined area having been vaccinated. The total number of animals vaccinated amounted to 2907 head.

The death rate showed a great decrease from that of last month, and by paddocks is as follows:

Kawa mauka—2 cows.

Kawa makai—None.
Nihupohaku—1 mare; 1 colt.
Mauna Kaliko—2 cows; 1 steer.
Wainini—None.
Hanapai—None.
No. I paddock—1 cow.
No. II paddock—None.
No. III paddock—None.
Beef—None.
Stables—2 steers; 1 horse.
Kalihiwai district—None.
Kalihikai district—None.

From the above list it will be seen that a total of 11 deaths from anthrax occurred during the month, as against 56 deaths for the month of May.

A total of nine head—one bull and three steers—developed swellings on various parts of the body and were treated with serum in amounts varying from 50 cc. to 100 cc. Three received Cutter serum and six received Mulford serum.

Of the above number, seven made complete and rapid recovery and two died. The two that died were both steers; one had been vaccinated before and later became sickly and refused to eat. It was given 50 cc. Cutter serum, but failed to recover. The other was a wild steer from the mountains which had broken into Kawa mauka paddock and was found to be sick. It had never been vaccinated; 100 cc. Mulford serum was given subcutaneously, but the animal died the following morning.

The situation at Hanalei appears to be improving rapidly, and, while more deaths are to be expected from time to time, the outbreak is well under control.

On the 21st I received a telephone message from Dr. Glaisyer saying that anthrax had broken out among the sheep at Kealia. It was nearly dark when I arrived at the place of meeting, where a consultation was held between Dr. Glaisyer, Dr. Kuhns and myself. As far as I could learn, only one animal had died and had been buried before Dr. Glaisyer's arrival. How long it had been buried could not be definitely ascertained. An autopsy on the exhumed carcass led to little except a slightly enlarged dark soft spleen. Smears were made from this material and stained and examined by Dr. Kuhns, who pronounced the cause of death as anthrax.

Considering the lateness of the hour, and the isolated position of the sheep, I decided to do nothing until I had examined the slide myself, which I did the following morning, when I failed to find anything resembling anthrax. It was therefore decided not to vaccinate, but to await further developments, giving instructions to have the sheep watched closely and anything suspicious reported immediately. Nothing further developed in this herd, thereby demonstrating the non-existence of anthrax.

On June 25 a cow, which appeared perfectly healthy the day

before, suddenly died at Niumalu, close to Mr. J. H. Coney's place. Dr. Glaisyer made a post-mortem examination and could find little or nothing to indicate anthrax. Smear preparations from the spleen, made, stained and examined microscopically by himself, he declared negative. Later on Dr. Kuhns telephoned him saying that slides prepared by himself from the same piece of spleen revealed plenty of anthrax organisms.

I was called in consultation in the case by Dr. Glaisyer. The slides presented to me for examination were filled with bacteria bearing a strong resemblance to anthrax. There was certainly no comparison between the large number of anthrax-like organisms in this slide and the post-mortem lesions as described to me by Dr. Glaisyer. Taking everything into consideration I declared Niumalu district in a state of quarantine, and gave full instructions re guards, rounding up cattle, etc. A few days later, when the corral was repaired and all stock in the valley rounded up, Dr. Glaisyer and myself injected 96 cattle, 61 horses, 1 donkey, 2 carabao, a total of 160 head, using Cutter simultaneous vaccine. No further deaths had occurred, and there was no indication that any more would occur.

Anthrax Situation on Oahu.

At a joint meeting of the Board of Health and the Board of Agriculture and Forestry, it was decided to lessen the quarantined area, drawing the lines in closer to the Farm dairy, and so releasing from quarantine the Japanese dairies, thus allowing them to market their products. To this effect the following notice was promulgated:

NOTICE OF CHANGE IN ANTHRAX QUARANTINE AREA.

Notice is hereby given that, effective at noon on June 5, 1917, the quarantine area described in Sec. 2 of Rule XI of the Division of Animal Industry of the Board of Commissioners of Agriculture and Forestry, approved by the Governor on May 25, 1917, is reduced to the area described as follows:

Beginning at the west corner of Wilder avenue and Metcalf street, and running as follows:

1. Northeasterly 765 feet more or less to the northeast corner of Metcalf and Marques streets;
2. Easterly 131 feet along Metcalf street;
3. Southerly 256 feet across Metcalf street and along the west side of 12 ft. lane;
4. Easterly 11 feet across lane to fence;
5. Southerly 230 feet along fence to stone wall on top of bluff;
6. Southeasterly 190 feet down face of bluff and around base of sloping land to small bridge;
7. Southeasterly 560 feet along ditch along base of sloping land to premises of K. Matsumoto;
8. Southwesterly 40 feet along fence along premises of K. Matsumoto;
9. Southeasterly 117 feet along same;
10. Southwesterly 511 feet more or less along the northwest side of lane to Beretania avenue;

11. Northwesterly 1065 feet along the mauka side of Beretania avenue;
12. Northeasterly 236 feet along fence and cultivated ground to angle in ditch;
13. Northeasterly 630 feet along ditch;
14. Northerly 65 feet along ditch to a point near base of sloping land;
15. Northwesterly 654 feet along ditch;
16. Northeasterly 172 feet along ditch;
17. Northwesterly 215 feet along ditch and across to the north side of Metcalf street;
18. Northeasterly 420 feet along Metcalf street to the initial point.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Honolulu, T. H., June 5, 1917.

No deaths had occurred among the Farm cattle for some time and it looked as if the disease had been entirely checked, but on the 27th one cow was found dead and post-mortem lesions and microscopical examination demonstrated the presence of anthrax organisms.

It had previously been decided to remove the Farm dairy cattle to some place free from infection, and to allow the Board of Health officials to thoroughly clean up the place where the dairy had been. Various places were looked at, but all proved unsuitable. It was finally decided to repair the old glanders portion of the Quarantine Station, making it suitable for the Farm stock.

Tuberculosis Control.

The following animals were tested during the past month:
L. C. Clark—Tested, 3; passed, 1; condemned, 2.

Importations of Live Stock.

S. S. Maui, San Francisco: 1 ct. poultry, 1 dog, 1 ct. pigeons, W. F. X. Co.; 3 cts. pigeons, F. J. Lowrey.

S. S. Sonoma, San Francisco: 1 dog (fox terrier), Mrs. E. H. Whidden.

S. S. Lurline, San Francisco: 12 mules, Schuman Carriage Co.; 100 horses (2 died at sea), U. S. Q. M. Dept.; 28 Holstein cows, 2 Holstein bulls, C. W. Lucas 20 Hereford bulls, Alexander & Baldwin; 1 Berkshire boar, Kamehameha Schools; 1 ct. pigeons, City Transfer Co.

S. S. Niagara, Vancouver: 1 dog (Boston bull), Mr. Hammond.

S. S. Tenyo Maru, Orient: 5 cts. pheasants.

S. S. Manoa, San Francisco: 16 mules, C. Brewer & Co.; 1 dog (English bull), Lieut. S. M. Decker; 11 cts. poultry.

S. S. Matsonia, San Francisco: 1 cat, Mrs. L. Wight; 1 ct. poultry, W. F. X. Co.

S. S. Hyades, San Francisco: 73 horses, U. S. Q. M. Dept.; 8 Holstein bulls, Alexander & Baldwin; 2 cows, W. A. McKay.

S. S. Wilhelmina, San Francisco: 3 dogs (Airedales), W. F. X. Co. (Dr. A. R. Glaisyer); 3 dogs (Boston bull), Mrs. P. H. Gray.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

REPORT FOR JULY.

Honolulu, August 20, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit the following report for the month of July, 1917:

Anthrax Situation on Kauai.

The situation at Hanalei remains about the same as last month. A few more animals have died, but revaccination of the herd, which has already started, should bring the death rate from anthrax down to practically nothing.

Number of animals vaccinated and methods used: Mulford's simultaneous vaccine, 150 head; Cutter's double vaccine, 9 head; Cutter's simultaneous vaccine, 2 cows Niumalu and 532 head Hanalei.

A total of 691 head were vaccinated during the past month. On this number 681 head were from the revaccination of the Hanalei ranch herd.

The following deaths from anthrax occurred during the month:

Kawa mauka paddock—1 cow.
Kawa makai paddock—None.
Nihupohaku paddock—None.
Mauna Kalika paddock—2 cows.
Wanini paddock—None.
Hanapai paddock—None.
No. I paddock—1 cow.
No. II paddock—2 cows, 4 steers, 3 heifers.
No. III paddock—None.
Beef paddock—None.
Stables—1 horse.
Kalihiwai district—1 horse.

From the above list it will be seen that a total of 15 head died, microscopical examination in each case being positive. The carcasses, as usual, were burned.

Number of animals developing localized swellings after vaccination and given 50 cc. to 100 cc. serum: 2 cows, 18 horses,

3 steers—a total of 23 head. All of these animals excepting two made rapid and complete recovery. The two which died received 100 cc. Cutter serum, one receiving an additional 76 cc. Mulford serum.

Of the above horses 13 head were injected at Niumalu. During the past month two old horses died in this district, but these deaths cannot be attributed to anthrax. The situation there is clearing up rapidly, and if nothing further develops, the quarantine can be removed completely by the middle of August.

In view of the fact that no deaths from anthrax had ever occurred in that district known as Hanalei flats and included within the quarantined area, it was advised that the quarantine lines be withdrawn from Waiole bridge to Hanalei bridge, thus releasing that district and making it possible for the rice planters and vegetable growers to dispose of their produce. This action being approved by the Board of Agriculture and Forestry, the new lines were established on July 23. This reduced the quarantined area considerably and lessened the monthly pay roll by the salaries of four guards.

Anthrax on Oahu.

On the first of the month one heifer calf died at the Farm dairy, microscopical examination proving it a case of anthrax. It was therefore decided to revaccinate the entire herd, including all other animals on the place, and so, on July 3, Dr. Norgaard, assisted by Dr. C. Golding, who had arrived to take charge of the anthrax situation on Kauai, vaccinated with anti-anthrax serum the following animals: Cows, 85; bulls, 2; heifers, 5; calves, 15; horses, 12. Total, 129 head.

It having been previously decided to move the Farm animals to some other location, it now remained but to find a place which would be suitable. After spending considerable time in looking over different localities, none of which came up to the desired specifications, permission was finally obtained from the Bishop Estate to build a quarantine station on their land, which had been recently filled in. The land in question is located on the makai side of the Ala Moana road and adjoining the U. S. rifle range. A spot was finally selected, 1100 feet from the road and next to the seawall, and on this were erected corrals and buildings in every way suitable, and to this place the Farm animals were removed in drays, after being thoroughly washed off with reliable disinfectant. Since removal no more cases of anthrax have occurred.

Tuberculosis Control.

The following tests were made:

College of Hawaii—Tested, 1; passed, 1; condemned, 0.

Sorehead in Chickens.

Eight hundred cc. chicken-pox vaccine was made up during the month and shipped to various poultry raisers throughout the Territory.

Importations of Live Stock.

S. S. Nippon Maru, Orient: 2 dogs, Mrs. Lionel R. A. Hart.
S. S. Shinyo Maru, Orient: 2 cts. poultry, 2 cts. pheasants.
S. S. Manoa, San Francisco: 16 cts. poultry.
S. S. Matsonia, San Francisco: 1 ct. poultry, 1 ct. birds, W. F. X. Co.
S. S. Lurline, San Francisco: 16 mules, Schuman Carriage Co.; 2 heifers, 4 cows, J. P. Mendonca; 4 horses, C. W. Lucas; 4 horses, J. Wenzel; 2 horses, T. H. Davies & Co.; 2 cts. poultry; 1 ct. pigeons.
S. S. Ventura, San Francisco: 1 dog, Mrs. F. Beckford.

Respectfully submitted,

Leonard N. Case,
Assistant Territorial Veterinarian.

Marketing Division

Honolulu, T. H., August 20, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I respectfully submit the following report of the Marketing Division for the month of July, 1917:

During the month the division has received 174 consignments of 35 different kinds of produce from 90 different consignors. The consignors are located on the islands as follows: Oahu, 52; Hawaii, 13; Maui, 10; Molokai, 12; Kauai, 3. Among the goods received were dressed beef, veal and pork, live cattle and hogs, Irish and sweet potatoes, dry beans, grapes, bananas, onions, poultry, eggs, pohas and cabbage.

The consignment sales for the month, amounting to $12,352.82, are $3099.79 less than the sales for the month of June, but as the greater part of the bean and potato crops had been previously sold, this decrease was to be expected. The June sales were the largest in the history of the division.

Neither of the retail departments quite paid running expenses during the month, but changes have been made which should show a profit in each department for August. The total loss in the retail departments amounted to $29.92, but the profit on the consigned merchandise amounted to $727.95, leaving a net profit of $698.03.

The potatoes received by the division during the month were very poor, and parts of several consignments were returned to the consignors as unsalable. Most of the trouble is caused by the potato moth borer. A large percentage of the potatoes recently received from Maui and Kauai are badly infested by this pest.

Large quantities of grapes have been sold for the producers on Hawaii. These grapes are usually made into wine, but, due to the uncertainty regarding prohibition and the large quantity of wine now in storage, the producers are trying to find other uses for them. An attempt was made to make grape juice, but experiments showed that a product that would compare favorably with the standard brands could not be made from the Isabella grape.

With the approval of the Executive Officer I have appointed Messrs. John Watt, A. Hebard Case, J. F. O'Brien, Wm. W. G. Moir and John H. Midkiff, market demonstrators, for the districts of Oahu, Kauai, Maui, East and West Hawaii, respectively. These men, who are also agents of the Territorial Food Commission, are supposed to look after the interests of the division in their respective districts.

The new bookkeeping system installed July first is working fairly well, but requires considerably more work than the old system.

I enclose herewith a statement of operations for the month and a copy of the general ledger trial balance.

Respectfully submitted,

A. T. Longley,
Superintendent, Territorial Marketing Division.

General Ledger Trial Balance, July 31, 1917.

Furniture and Fixtures	$ 3,076.92	
Automobiles	1,286.50	
Motorcycle	60.00	
Pineapple Crates	2,676.20	
Butcher Department	653.42	
Retail Department	152.59	
Seed Account	783.30	
Bank of Hawaii	705.14	
Petty Cash	150.00	
Accounts Receivable	5,682.16	
Longley & Westgate	3,000.00	
Consignors' Account		$ 3,853.02
Vouchers Payable		1,698.19
Note Bank of Hawaii		3,000.00
Revolving Fund, 1915-1917		5,194.53
Reserve for Doubtful Accounts		2,414.29
Seed Appropriation		1,841.11
Appropriation, 206A		250.00
Appropriation, 206B		1,004.56
Appropriation, 206C		160.00
Surplus		851.64
Consignment Expense		118.35
General Expense	1,477.13	
Butcher Sales		3,181.26
Retail Sales		1,534.23
T. Pearson & Co.		36.25
Hold Account	143.03	
Commissions		617.36
Departmental Expenses	297.42	
Cost of Merchandise	4,421.34	
Cash not deposited July 31, 1917	1,189.64	
	$25,754.79	$25,754.79

Cash Receipts and Payments for the Month Ended July 31, 1917.

Receipts.

Balance	$ 6,491.27
Cash Sales, Consignments	677.50
Cash Sales, Butcher Department	1,644.79
Cash Sales, Retail Department	923.63
Accounts Receivable	8,785.82
Appropriations	1,482.83
Total Receipts	$20,005.84

Payments.

Salaries	$ 1,050.00
Butcher Department Expense	201.90
Retail Department Expense	000.00
Furniture and Fixtures	47.50
Consignors' Net Proceeds	4.00
Merchandise Purchased	247.85
Office Expense	123.46
Auto Expense	151.16
Seed Account	68.27
Consignment Expenses	23.40
Miscellaneous General Expense	52.09
Accounts Payable (June 30, 1917)	16,141.50
Total	$18,111.13
Balance on Hand	$ 1,894.71

Report for Month Ended July 31, 1917.

Sales:		
Consignment sales, outside		$ 9,064.15
Consignment sales, to retail department		3,288.67
Butcher department sales		3,270.47
Retail department sales		1,633.63
Total sales		$17,256.92
Consignments Merchandise:		
Consignment sales		$12,352.82
Consignors' net proceeds	$10,797.86	
Consignment expenses	827.01	11,624.87
Profit		$ 727.95

Retail Department:	
Inventory, first of month	$ 169.89
Consigned merchandise purchased	880.85
Other merchandise purchased	599.67
Expenses	19.30
Other merchandise charges	126.05
Total	$ 1,795.76
Sales:	
Cash sales	$ 897.00
Credit sales	736.63
Inventory, close of month	152.59
Total	$1,786.22
Loss	9.54
Butcher Department:	
Inventory, first of month	$ 762.52
Consignment merchandise purchased	2,407.82
Other merchandise purchased	394.32
Expenses	278.12
Other merchandise charges	98.03
Total	$3,940.81
Sales:	
Cash sales	$1,644.79
Credit sales	1,625.68
Inventory, close of month	641.14
Charged by journal entry	8.82
Total	$3,920.43
Loss	$ 20.38
Net profit	698.03

BY AUTHORITY.

TERRITORY OF HAWAII.
BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

RULE IV. DIVISION OF FORESTRY.

The Board of Commissioners of Agriculture and Forestry hereby makes the following rule and regulation for the protection of bird, animal and vegetable life on certain islands of the Territory of Hawaii.

Section 1. It is unlawful for any person to hunt, trap, capture, wilfully disturb or kill any bird or any animal of any kind whatever, or to take, injure or destroy the eggs of any bird, or to cut, chop, burn, injure or destroy any vegetation on the islands of Moku Manu, Moku Lua, Popoia, Manana, Kaohikaipu, Mokuhooniki and Kapapa, except as authorized by written permit from the Superintendent of Forestry.

Section 2. The going on or being upon said islands with intent to destroy, molest, disturb, or injure any bird, animal or vegetable life

thereon without a written permit from the Superintendent of Forestry is forbidden and declared to constitute trespass punishable by fine.

Section 3. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed Five Hundred Dollars ($500.00), as provided by Section 529, Revised Laws of Hawaii of 1915.

This rule shall take effect upon its approval by the Governor of Hawaii.

Approved this 28th day of July, 1917.

LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii.

BY AUTHORITY.

TERRITORY OF HAWAII.
BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

NOTICE OF REPEAL OF RULE VII—DIVISION OF ANIMAL INDUSTRY.

Notice is hereby given that Rule VII of the Division of Animal Industry prohibiting the shipment, transfer, or exchange of hogs from the Island of Oahu to any other island of the Territory of Hawaii, adopted by the Board of Commissioners of Agriculture and Forestry and approved by the Governor of Hawaii on July 10, 1913, is hereby repealed and declared to be no longer in effect.

Approved this 28th day of July, 1917.

LUCIUS E. PINKHAM,
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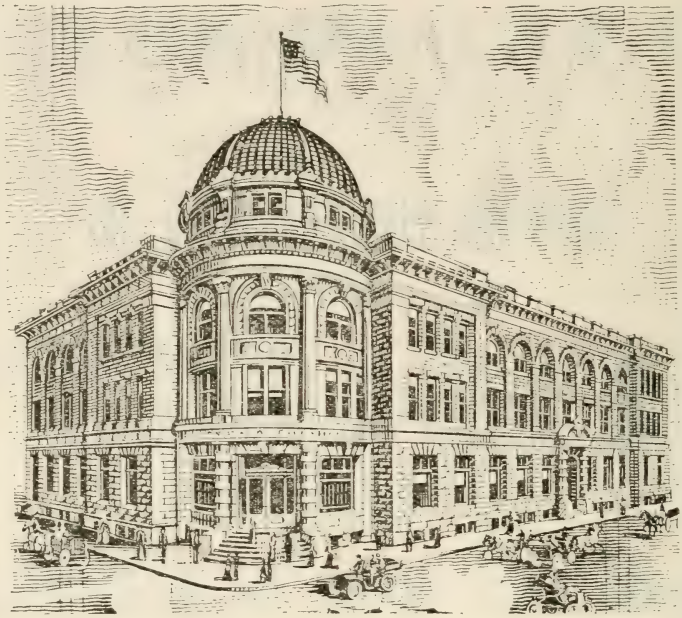
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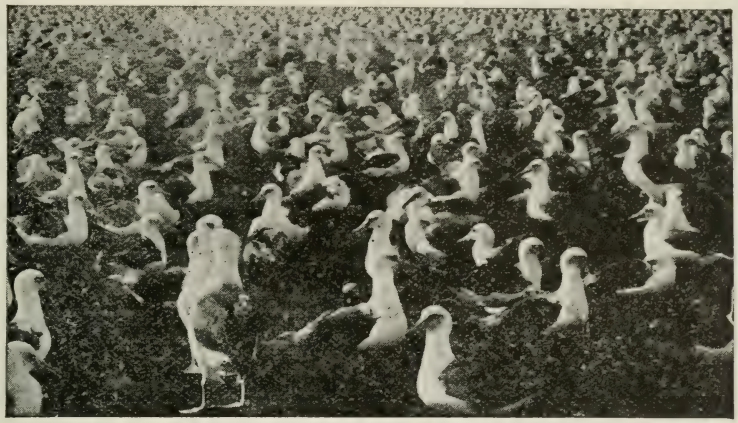
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THE HAWAIIAN FORESTER AND AGRICULTURIST

SEPTEMBER, 1917

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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

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The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale, the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

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A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

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THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, SEPTEMBER, 1917. NO. 9

These Islands are usually blessed with beneficial rains which keep the earth watered and our waterpipes and tanks full. At such times there is very little or no menace to the forests by fire, but during a dry spell, such as we have experienced during the past few months, the danger to our native forests by the careless use of fire reappears and it behooves everyone who visits the foothills or mountains to take the most careful precautions against starting any fire on grass or forest lands. Fortunately during the present danger period there have been only a few fires, mostly in open grass lands, which have been promptly extinguished.

Action on Rule IV of the Division of Forestry, recently passed by the Board, by placing suitable signs on the small rock islands off the windward coast of Oahu and watching out for trespassers should do much to preserve the few remaining sea birds which nest on these island refuges and are a distinct addition to our Hawaiian fauna.

In the recent tree introductions into the Territory some of the species already show great promise, and it is confidently hoped that there will be a great many trees which will be a distinct addition to our island flora not only for timber production but also for water conservation purposes.

The fiscal year report of the different divisions, printed in this number, gives a resume of work done during the twelve months ended June 30, 1917, and the progress and activities up to that time.

The new plant inspection and quarantine building is being erected for the Board on Kekuanaoa street near the waterfront and when completed with the fumigation building will present facilities which will greatly assist the Division of Plant Inspection in rendering more efficient service in keeping insect pests out of the Territory.

The article by Chief Plant Inspector Ehrhorn on methods of fumigating stored products to prevent infestation, appearing in this number, will be of assistance to all food producers and dealers who have to face this problem.

The removal of the Farm dairy animals to new quarantine quarters and their detention for over 30 days without a further outbreak of anthrax and the thorough burning of the old dairy premises have cleared up the anthrax situation on Oahu so that now the people may rest easy. The situation on Maui has come to a satisfactory close and although there were a few deaths during August from anthrax on Kauai, where the infection was severe, the outbreak there may be considered at an end.

Remedies for Insects Infesting Stored Products

By E. M. Ehrhorn,
Chief of Division of Plant Inspection.

The chief loss of grains, beans, and other products in stores, mills, grainbins or on the farm (especially products that have been stored for some time) is caused by insects, usually very minute beetles and their larvae, or the larvae of small moths. So sudden is the attack that one wonders how and from whence the pests appear.

In our semi-tropical climate much of the infestation begins in the field from the time of the ripening of the crop to its storage in bins or warehouses. The often heard remark that "beans are weevly" or "flour or cereal is wormy" are results of insect infestation, as quoted above.

Fortunately, the several important insects causing this infestation are amenable to like treatment.

Aside from various preventive considerations, such as the prompt hulling of corn and beans after harvesting, the thorough cleaning of the bins where old material has been stored before refilling them with the new crop, and the removal of all infested grain or meals from the building in which a new crop is to be stored, the principal remedy is fumigating all such stored products with carbon bisulphide immediately after the bins are filled; or, if the crop is to be stored in sacks, the whole output should be thoroughly fumigated before stored in the warehouse.

Another matter which is especially important to the small farmer is the practice of clean culture in his fields. Much of the weevly condition of bean crops is due to the neglect to remove and burn all trash left lying about the field and the accumulation of waste material along the edges of the field. The cleaning up of all such material will remove a lot of breeding places which hold the various pests until the new crops are ready to attract them.

The best and most lasting remedy, however, is fumigation with carbon bisulphide. This liquid is applicable only where its vapor or gas can be confined quite closely. The vapor is much heavier than air, and on account of this it is well adapted for fumigating seeds in tight bins, because the vapor descends into the bins

through the seed and rises as it drives the air out. It has also great penetrative power, and any products contained in bags, such as beans, rice, corn, flour and grains when infested, can be placed in tight compartments and fumigated successfully.

Carbon bisulphide is a very explosive liquid and can be placed on a par with gasoline. It is therefore very necessary to keep it away from fire. There must therefore be no smoking or carrying around of lights when fumigation is being done, nor should any electric current for light or fans be present, as the spark will ignite the vapor and cause an explosion. With these precautions anyone can use the liquid and obtain success.

The small farmer can construct his small fumigating box or if he has a good tight wine barrel he can use that. The larger producer can build a permanent structure of concrete which is by far the best, or if not out of T. and G. lumber, the walls, floor and roof made double with building paper between. The door should have beveled edges and should match well into the frame.

Bisulphide of carbon is a colorless liquid with a very offensive odor, locally known as "highlife" and is very volatile. When applying it for fumigating of stored grains or other materials it is used at the rate of one pound to 1000 cubic feet. The liquid should be poured into shallow pans, as the quicker it evaporates the better the results will be from the vapor. The pans should be placed on top of the grain to be fumigated, as the vapor being heavier than air will descend to the bottom of the room and gradually rise and fill the compartment. All material should be left in the fumigating room or box for at least 24 hours or, better, 48 hours. The vapor is very penetrating but when the grain, beans, corn and other foodstuffs are in bags a longer time is necessary to allow the vapor to reach every space. The bags should be carefully piled, especially when a large quantity is to be fumigated. Care should be taken to allow plenty of air space between them so that the vapor can readily reach each bag. When milled grain, like flour, middlings and other products have to be fumigated, owing to the density of these products, double the quantity of carbon-bisulphide should be used.

Summary.

It is absolutely necessary to have a tight box, barrel or room for fumigation.

If grain is in bags, the bags should be so placed as to allow free access of the vapor of carbon-bisulphide to all parts as near as possible.

Shallow pans should be used for the liquid and should be placed at the top of the pile to be fumigated.

From one to two pounds of carbon-bisulphide should be used for every 1000 cubic feet according to the density of the product to be fumigated, and should be subjected to the vapor for at least 24 hours, longer if possible.

As the liquid is very volatile and extremely explosive care should be taken not to allow any light or smoking around the building where the carbon-bisulphide is used.

Carbon-bisulphide can be purchased at any drug company and in any quantity. For small fumigations one gallon cans are handy. If larger quantities are kept on hand care should be taken to keep the container tightly corked to prevent evaporation. Cover corks or openings with paraffin wax.

Protecting Wild Life

NEW RULE OF THE DIVISION OF FORESTRY FOR BIRD, ANIMAL AND VEGETABLE LIFE PROTECTION ON CERTAIN SMALL ISLANDS.

The Board at its meeting on July 20, 1917, passed Rule IV of the Division of Forestry, which received the approval of the Governor on July 28, and which appeared in the By Authority page of the last issue.

The initial steps in this direction were taken during the 1917 session of the Legislature, when Representative Gerrit P. Wilder introduced a concurrent resolution for the protection of the birds on these small islands. This was afterward changed in the Senate to a bill and passed as Act 214, which gives authority to this Board to pass and enforce this rule.

The report of the Superintendent of Forestry recommending the adoption of Rule IV is as follows:

Honolulu, July 5, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—Act 214 of the 1917 session of the Legislature authorizes this Board to promulgate rules and regulations for the protection of bird, animal and vegetable life on six small islands off the windward coast of Oahu and one island, Mokuhooniki, off the eastern end of Molokai, and prescribes that the violation of any such rules and regulations shall be subject to the usual penalty of not to exceed $500.

Rule IV of the Division of Forestry has therefore been prepared to comply with the provisions of this act, and is herewith presented for your approval.

It is my plan to have suitable signs painted in the English, Hawaiian and Japanese language posted on these islands as the initial step in enforcing Rule IV.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

Hog Embargo Removed

REPEAL OF RULE VII, DIVISION OF ANIMAL INDUSTRY, RELATING TO THE SHIPMENT OF HOGS FROM OAHU.

At the meeting of the Board held on June 20, 1917, it was voted to repeal Rule VII of the Division of Animal Industry, which prohibited the shipment of hogs from Oahu to the other islands in the group. Rule VII was passed in 1913 at a time when hog cholera was prevalent on Oahu and it was necessary to prevent the spread of the disease to the other islands.

In the following report on the matter the Territorial Veterinarian points out the reason for no longer continuing this prohibition. The notice of repeal of Rule VII was approved by the Governor on July 28, 1917, and appeared in the By Authority page of the last issue:

Honolulu, July 19, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—With reference to Rule VII of the Division of Animal Industry, prohibiting the shipment, transfer or exchange of hogs from the Island of Oahu to any other island of the Territory of Hawaii, it is recommended that said rule be repealed.

No case of hog cholera has come to the notice of this office for more than a year, and the disease known as swine plague, while still occurring now and then, is no more prevalent on Oahu than on any of the other islands. Under these circumstances Rule VII acts as a hindrance to trade only, and its usefulness has come to an end.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

Fiscal Year Transactions

REPORT OF THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY FOR THE FISCAL YEAR ENDED JUNE 30, 1917.

Changes in the organization of this Board, which looks out for the auxiliary interests of pure agriculture in the Territory, made effective by the 1917 session of the Legislature, resulted in the transfer on March 23, 1917, of the Division of Hydrography to the Commissioner of Public Lands, to whose work hydrographic activities are now more closely related, and provided for the taking over by this Board of the Territorial Marketing Division on July 1, 1917, and on the same date for the separation, in the interests of efficiency, of the old Division of Entomology into a Division of Plant Inspection to care for plant quarantine and inspection to prevent injurious insects from entering the Territory and a Division of Entomology to care for the work of beneficial insect introduction, propagation and distribution, suppressing injurious insects already here, and other general entomological work. The Board, as reorganized, now consists of five divisions —Forestry, Plant Inspection, Entomology, Animal Industry, and Marketing, all of which are supported by specific appropriation out of the general revenues.

Forestry.

The increasing value of water in these Islands, not only for the irrigation of agricultural fields, but also to meet the domestic needs of a growing population, has already justified the activities of the Division of Forestry during the past fourteen years in the effort to conserve and increase the sources of water supply by forest protection and extension. The division has, therefore, had this same object in view during the past year and in seeking to accomplish it has emphasized the work of fence building to keep stock from the native forests, the expansion of the field protective organization, the inclusion of additional forest areas in the reserve system, and the extension of the forests by actual tree planting.

During the fiscal year just ended 11.43 miles of new fences were constructed on forest reserve boundaries in Lualualei, Palolo, Makiki and Manoa valleys on Oahu and at the Olaa Forest Park and Upper Olaa reserves and at Kawaihae on Hawaii. Stretches of fences in Nuuanu, Oahu, and at Piha, Hawaii, amounting to 2.12 miles, were also repaired, making a total of over thirteen and a half miles of boundary effectively guarded against damaging stock.

One new forest ranger was appointed during the year and was assigned to Maui. The present force of six rangers on the four

main islands is sufficient to handle the routine work of forest protection combined with tree-planting work. They operate under Rule II of this division, which was passed in April, 1916, and which satisfactorily provides for the efficient preservation and administration of the forest reserves.

The only forest fire which occurred during the year was on the Military Reservation at Waianae-uka, on the Koolau range, where on June 25, 1917, about 50 acres of grass land with some patches of forest were burned over. This fire was promptly extinguished the same day by two troops of cavalry and 90 prisoners of war.

Two new forest reserves were set apart by official proclamation during the year, the Round Top Reserve, consisting of 115 acres of government land back of Honolulu, Oahu, adjacent to the existing Honolulu Watershed Forest Reserve, and the Panaewa Forest Reserve, consisting of 1750 acres of government land, in Waiakea, Hawaii, four miles out of Hilo and along the road leading to the volcano of Kilauea. This brings the total number of forest reserves in the Territory up to 40, with a total acreage of 800,094 acres.

The planting of trees in the Territory has continued on an increased scale, for the people are alive to the fact that water-producing mountains and waste land should properly be devoted to this purpose. During the past calendar year 660,079 trees were raised and distributed from the government nurseries for general planting throughout the Islands, and during this same period 925,400 trees were planted by both the government and private parties. Of this number 43 per cent was planted for water conservation, 35 per cent for fuel, 16 per cent for windbreak and 6 per cent for timber and ornament. The tree-planting activity of this division has been centered on water-producing areas back of Honolulu, on Oahu, and on two similar areas on Kauai. Considerable progress has also been made in the introduction and establishment of trees from other tropical countries, such as Australia and India, which will be suitable for the purposes of watershed cover and for timber production. An intensive experiment to determine the growing qualities and value of many introduced species has been started at the Manoa Ranger Station, where 50 different kinds of trees have been planted in varying amounts. On Arbor Day 20,979 trees were distributed for general planting throughout the Territory.

Entomology.

The work performed by the Chief Plant Inspector and his assistants during the fiscal year ended June 30, 1917, consisted of the inspection of all fruits, vegetables and plants coming into the Territory from foreign countries and the mainland of the United States, to prevent the introduction of pests and plant diseases liable to become injurious to the various agricultural industries

of these Islands, and the inspection of all fruits, vegetables and plants going from the port of Honolulu to the ports of all the other islands for the purpose of preventing the spread of any pest now existing on Oahu, as well as any future introduction of pests or fungi from Honolulu, the only port of entry for plants and plant products from foreign countries.

During this period there arrived at the ports of Honolulu, Hilo and Kahului, the only ports in the Territory where shipments of fruits and vegetables can enter directly and at which places local inspectors are stationed, 714 vessels. Of these, 331 carried vegetable matter, consisting of 316,052 packages of fruits and vegetables and 8233 packages of plants and seeds. Of this amount 6917 packages had to be fumigated on account of infestations of various kinds, 811 packages were destroyed by burning on account of either serious infestations or of being contraband, and 107 packages were returned to the original shipper as contraband and unmailable.

Many vessels also came to Honolulu for coal and other supplies on their way to the Orient, passing from the Atlantic to the Pacific through the Panama Canal. All these vessels were boarded and inspected for vegetable matter, so that no infested material on board should escape and be the cause of new pest introduction while the vessels were in port. Notices pertaining to fruit and plant shipments are served to the proper officers, who are then prepared on their future visits to comply with the rules and regulations of the territorial as well as the federal plant inspection.

The local consumption of fruits and vegetables imported from the Pacific coast is increasing with our growing population, and of late years, owing to the thorough system of county inspection, all fruits and vegetables are of better quality. The following were some of the larger staples imported:

Oranges	23,528 boxes
Lemons	5,523 boxes
Cabbage	1,113 crates
Celery	2,262 crates
Onions	22,798 bags
Potatoes	85,586 bags

During the past year large quantities of onions and potatoes have been produced on these Islands, both of excellent quality, showing that in time some importations at least could be reduced.

The inspection of horticultural produce leaving Honolulu for ports on the other islands has been continued on similar lines as last year. During the fiscal period 754 steamers were attended to and 10,967 packages of plants, fruits and vegetables were inspected. Of this number 187 packages were seized and refused shipment on account of infestation or of having undesirable soil

attached to the roots of plants which was liable to carry pests or diseases.

The new quarters which will soon be completed for the Division of Plant Inspection near the waterfront in Honolulu will greatly facilitate and increase the efficiency of plant quarantine and inspection.

The remainder of entomological work carried on during the past year, by a staff composed of one entomologist and two laboratory assistants, has consisted of introducing and propagating beneficial insects, advising in regard to agricultural and stock pests, and the care and upkeep of the insect collections.

During the year just passed two important parasitic insects have been introduced and established, one a small wasp-like insect living at the expense of the melon fly, a serious pest of fruit and vegetable gardens, the other a minute hymenopterous insect developing in and destroying the egg of the corn leaf hopper, the worst pest of Indian corn in the Islands. These two insects have been propagated in large numbers and distributed throughout the Islands, and it is believed that great benefit has been derived from them. The corn crop, which is of such importance at the present time, has been much better this year than in any previous year. Meanwhile the propagating of the parasitic insects introduced to control the ravages of the fruit fly and to keep down the number of dung flies has been continued, and it is believed these destructive and annoying pests are in some measure controlled.

No new lines of work have been undertaken on account of the difficulties of work in foreign countries during the continuance of the war, but the force and equipment is in the best condition possible to handle any beneficial introductions, and there are still opportunities to improve the conditions surrounding agriculture and stock raising by the methods which have been followed in the past.

The insect collections for reference and study have been overhauled and large accessions have been made to them, notably through gifts of Commissioner W. M. Giffard, and the miscellaneous collections of field workers. During the year, among other things, a study has been made of the native bees of the genus species *Prosopis*.

Animal Industry.

During the past year there has been a steady progress in the development of practically every class of domestic animal here without the interruption or setback of drouth or, with one exception, of disease. The rigid inspection made by this Division of all imported animals has been successful in keeping out of the Territory such diseases as rabies, foot and mouth disease and Texas fever which are proving such a scourge elsewhere. The imports of beef and dairy cattle have been represented by individuals of superior merit and the beneficial effect of pure-bred

bulls on the beef production is now an established fact with the result that the Territory is self-supporting so far as beef is concerned. The same may be said of hog meat, for the importation of swine was confined to pure-bred stock for breeding purposes and no hog cholera occurred during the year in island piggeries. Although the importation of mules for plantation use has continued at about the same rate, the number of horses imported has been less, due to the fact that the Army is buying island-bred horses in increasing numbers for cavalry remounts. Merino rams from New Zealand and America have been imported to improve the breeds on various ranches where sheep raising is profitable. Poultry and dairy products are still imported in increasing amounts to supply market demands. The improvement of all classes of live stock in the Territory has been accelerated by the opportunity of friendly competition offered by the county fairs held during the year on Hawaii and Maui.

The Division has successfully introduced and put to effective use a cure for sore-head in poultry, which has been the means of saving many flocks from extermination. Unfortunately this increase in poultry flocks has been somewhat offset by the unprecedented high cost of chicken feed.

The campaign for the eradication of bovine tuberculosis in the Territory has progressed with satisfactory results and the number of animals reacting to the test has been reduced to 2.87 per cent. In the 18 new dairies started during the calendar year 1916 all the animals were found to be free from tuberculosis. The passage of an act by the last legislature, whereby $20,000 was made available for the indemnification of owners of cattle destroyed on account of tuberculosis, will doubtless greatly aid the Division in the complete eradication of this disease.

The only serious outbreak of an animal disease during the year was the sudden appearance of anthrax in April on a large ranch on the windward side of Kauai. This was followed late in May by an outbreak of the same disease in a dairy herd on the outskirts of Honolulu on Oahu, and early in June by outbreaks in several different pastures on the Island of Maui. As soon as the outbreak occurred quarantines were placed on each island and the infected districts were closely guarded to prevent the spread of the disease. Carcasses of animals dying of the disease were located as speedily as possible and cremated at once. Supplies of serum vaccine were cabled for and by its use the spread of the disease was greatly checked. Fortunately it was possible to secure from the legislature, still in session when the first outbreak occurred, a special appropriation of $25,000 to combat the disease. The question of how anthrax reached the Territory, where it has never occurred before, remains an unsolved puzzle since it would be next to impossible for the disease to reach these shores by means of live animals because, when the infection once gains an entrance into the blood, the victim dies in the course of a few hours to two or three days. The

theory that it was brought in with imported grass seed is refuted by the appearance of the disease in pastures where no imported seed was ever planted. Another theory, that it may have been introduced with imported bone meal, has also failed of proof after exhaustive bacteriological experiments. In the meantime everything is being done to control the disease in infected districts and to prevent its spread to the Island of Hawaii.

Division of Forestry

Honolulu, Hawaii, September 5, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of August, 1917:

Forest Fires.

Owing to the continued dry weather the danger of grass and forest fires has increased and fire warning notices have been posted by the District Fire Wardens and Rangers to remind the people of the necessity of being careful with the use of fire. On Oahu two small grass fires have occurred lately in the vicinity of Maili ridge near Schofield Barracks, but have been promptly extinguished by the army.

On Hawaii the homesteaders on the land of Laupahoehoe have been clearing land for cane and several times the forest has been threatened by fires which have escaped. This prompted Mr. R. A. Hutchinson, manager of the Laupahoehoe Sugar Company, through Theo. H. Davies and Company to recommend the appointment of Mr. H. S. Rickard of Laupahoehoe as an Assistant District Fire Warden to keep a special watch to prevent the starting of forest fires in this region. To relieve the situation, the President accordingly on August 24 issued such a commission, confirmation of which is hereby respectfully recommended.

Forest Planting.

The work on government lands in the forest reserve in upper Manoa Valley consisted mainly in clearing around the koa trees where weeds and grass had grown up. In addition to this 400 koa trees were planted out during the month. Several hundred willow slips have been sent up Manoa for planting in a swampy area near the forest boundary.

Entomologist D. T. Fullaway kindly visited the planted trees with me one day to inquire into the cause of the damage that was noticed had been done to quite a number of the young koa trees. It was found that soon after planting out the main stem would be severed by a clean cut several inches above the ground. A careful examination failed to show that the injury was caused

by any insect and we reached the conclusion that it could most probably be ascribed to mice which cut the stems in search of food. The damage fortunately is not serious since the plant recovers rapidly by sending up a side shoot for the leader.

On August 23 the Forest Nurseryman and myself, assisted by the tree planters, set out and properly tagged on the Manoa Ranger Station three young plants each of 39 different species of Australian trees, the seeds of which had been kindly furnished by Mrs. C. C. Kennedy. Among these are many new species which will be tested out here for growth to determine whether they are suitable for general planting in the Territory.

By the "Makura" on August 21 two boxes of plants and young trees were received from Mr. E. Mitchelson of Auckland, New Zealand. This gentleman had recently been in Honolulu and in return for seeds and plants that had been furnished him kindly sent these in return. Among the shipments are 25 Kauri pines and several other valuable timber trees which should do very well in these Islands.

Hauula Forest Reserve.

Several days were spent on the proposed Hauula Forest Reserve where the homesteaders on August 6 began the construction of a fence on the revised boundary to keep cattle from getting into the native forest. Forest reserve monuments were also placed on conspicuous points along the line. Recommendations for setting apart this government forest land as a reserve will soon be presented.

Miscellaneous.

A visit was made to the Island of Kapapa in Kaneohe Bay which is included among the islands covered by Rule IV for the protection of bird, animal and vegetable life. It was ascertained from local fishermen and by inspection that the island, which is only about three acres in extent, is not a continuous nesting place for native birds, but that it is visited at certain seasons of the year only by migratory birds.

Examinations were made into several proposed land exchanges on Tantalus and into additional areas in need of forest planting.

Forest Ranger Hosea K. Lovell began his duties on August as Ranger for the Island of Kauai.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, August 31, 1917.

Superintendent of Forestry, Honolulu, T. H.

Dear Sir:—The following is a report of the principal work done during the month of August:

Nursery—Distribution of Plants.

	Transplants In Boxes	Pot Grown	Total
Sold	200	110	310
Gratis	650	382	1032
	850	492	1342

Collections.

Collections on account of plants sold	$ 4.30
Rent of office building, Nursery Grounds (June)	35.00
Total	$39.30

Plantation Companies and Other Corporations.

The distribution of plants during the month amounted to 28,000 seedlings.

Judging from the number of orders already coming in for trees there will be a great deal of planting done during the coming rainy season.

Makiki Station.

The work at this station has been principally routine, namely, potting and transplanting trees, mixing and sterilizing soil, etc.

Honolulu Watershed Planting.

We are now planting trees in the main Makiki Valley. The bare spaces around the spring heads are all being planted, also the bare slopes lower down. 1315 koa trees have been planted during the month.

Advice and Assistance.

The following number of requests were made during the month for advice and assistance:

Visits made	8
Advice by letter	4
Advice by telephone	6
Advice given at Nursery	12

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

Division of Entomology

Honolulu, Hawaii, August 31, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—During the month of August the insectary handled 2,400 pupae of the melon fly, from which emerged 599 females and 510 males *Opius fletcheri.*

The distribution of parasites was as follows:

Opius fletcheri.

	Females	Males
Oahu—		
Fort Ruger	75	50
Sheridan Street	285	215
Kauai—		
Kealia	75	50

Galesus.

Oahu—		
Kalihi	20	25

Chalcid.

Oahu—	
Kalihi	300

Tetrastichus.

Oahu—	
Kalihi	400

Paranagrus (Corn leaf hopper parasite).

Oahu—

Makiki Nursery	1350
Young Street	1150
Kauai—	
Kapaa	1150

Respectfully submitted,

DAVID FULLAWAY,
Entomologist.

Division of Plant Inspection

Honolulu, Hawaii, August 31, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of August, 1917, as follows:

During the month there arrived at the port of Honolulu 54 vessels, of which 23 carried vegetable matter and one vessel brought moulding sand. Two vessels passed through the Canal Zone in transit to the Orient.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1,508	29,991
Fumigated	18	367
Burned	53	56
Returned	1	2
Total	1,580	30,416

Of these shipments 29,971 packages arrived as freight, 360 packages as baggage of passengers and immigrants and 85 packages as mail matter.

Rice and Bean Shipments.

During the month 71,926 bags of rice and 6,211 bags of beans arrived from Japan and oriental ports. Of these, one lot of 40 bags was found infested with the rice weevil and the larvae of a meal beetle *Tenebroides mauritanica* and was fumigated with carbon bisulphide for 48 hours. All the rest was passed as free from pests. I have again given warning to the shippers of rice and to the agents of the steamship company drawing attention to Rule III, which requires that all rice shall be fumigated at the ports of embarkation in Japan.

Pests Intercepted.

Approximately 5,496 pieces of foreign baggage belonging to passengers and immigrants from foreign countries were examined and from the same were seized and destroyed by burning 40 packages of fruit and 9 packages of vegetables.

On August 2, a package of tree seeds by mail from India for J. F. Rock was fumigated as a precaution.

Two packages of Algaroba seed pods by mail from France were returned as unmailable.

On August 6, per S. S. Korea Maru, in the baggage were found the following:

2 packages of Chrysanthemum plants, found infested with larvae of Depidopteron were burned.

1 crate of vegetables containing a nest of ants, *Prenolepis longicornis,* burned.

1 package of bulbs fumigated as a precaution.

1 miniature garden, soil removed and passed.

On August 7, per S. S. Columbia from Manila:

2 cases of orchids, fumigated as some of the packing showed evidences of larvae and pupae of a Tineid moth.

On August 9, per S. S. Manoa from San Francisco:

1 box of peaches, infested with the peach moth, destroyed by fire.

On August 14, per S. S. Matsonia from San Francisco:

1 box ornamental plants, all soil removed and plants fumigated on account of Aphis.

On August 17, per S. S. Siberia Maru from Japan:

1 ornamental plant in baggage burned on account of infestation.

On August 21, per S. S. Makura from Australia:

2 boxes of forest trees for our Board. All soil was removed and one box fumigated on account of Psyllid infestation; the leaves of the infested plants were removed and destroyed.

On August 28, per S. S. Kestrel from Fanning Island:

The crew had 150 coconuts which showed slight infestation of scale and which were fumigated before they were landed.

On August 30, per S. S. Tenyo Maru from Japan:

A Juniper tree and a Wistaria plant were found in the baggage and were fumigated and the soil removed.

A passenger had 9 ornamental plants which he was taking to Canada. These, apparently free from pests, were held in quarantine by us until he continued his journey.

By freight our Board received 2 large bags of palm seeds from Manila which were fumigated as a precaution.

One basket of beneficial insects came for the H. S. P. A., and was examined by Mr. Swezey and myself, and all the soil and packing was burned.

Hilo Inspection.

Brother M. Newell reports the arrival of two steamers which carried vegetable matter consisting of 163 lots and 2054 packages, which, being free from pests, were passed for delivery. During the month the Kiyo Maru arrived direct from Japan and brought 3,474 bags of rice, 236 bags of beans, 11 bags of sesame seed and 9 packages of vegetable seeds. Two hundred and twenty bags of rice were infested with the rice moth and were rushed to the mill and run through the cleaner.

Kahului Inspection.

On August 20, Mr. Will J. Cooper was granted permission to leave for the Officers Training Camp, and Mr. E. C. Moore of Haiku will act as a substitute during his absence.

During the month two vessels arrived at the port of Kahului, which brought vegetable matter consisting of 95 lots and 583 packages of fruits and vegetables. Four boxes of turnips were again condemned on account of being infested with the radish maggot, and ordered dumped at sea.

Inter-Island Inspection.

Fifty-nine steamers plying between Honolulu and other island ports were attended to, and the following shipments were passed as free from pests:

Taro	501 bags
Plants	242 packages
Vegetables	213 packages
Fruit	20 packages
Total	976 packages

Three packages of plants and three packages of fruits were seized and refused shipment on account of infestation and undesirable soil.

Respectfully submitted,

E. M. Ehrhorn,
Chief, Division of Plant Inspection.

Division of Animal Industry

Honolulu, Hawaii, September 6, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I beg to submit the following report for the month of August, 1917:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	Tested.	*Passed.*	*Condemned.*
Castle Home	4	4	0

Anthrax Situation in Honolulu.

Since the removal of the Farm animals to the special quarantine station on the Ala Moana Road, no deaths have occurred among them from anthrax. In fact they can no longer be considered as anthrax animals and by the end of this month or as soon after as practicable the quarantine will be raised and the animals turned over to Mr. Farm to dispose of them as he sees fit. They are now no longer a source of danger to the public and the milk from these animals is as fit for human consumption as before the outbreak.

Anthrax Situation on Kauai.

The situation on Kauai is steadily improving, in fact we may consider the outbreak at an end. During the month 1 horse, 1 colt, 1 mule, 4 cows, 1 heifer and 2 calves have died of anthrax on the Hanalei Ranch, in all a total of 10 head. No deaths from anthrax have occurred on the ranch since the 24th of August which would seem to indicate that the outbreak has exhausted itself.

The revaccination of the ranch herd is now complete, Dr. Golding having vaccinated a total of 700 head this past month. Another vaccination will be made at the next drive some time in January, 1918.

The situation at Niumalu has so far improved that the quarantine was raised on August 31st, and that particular outbreak may be considered at an end.

Sore-head in Chickens.

During the past month 1000 cc. of chicken-pox vaccine was made up and distributed among the poultry raisers of this island.

Importations of Live-stock.

S. S. Maui, San Francisco: 4 cts. poultry, A. J. Campbell.
S. S. Korea, Yokohama: 10 cts. pheasants, E. H. Paris.
S. S. Manoa, San Francisco: 67 cts. poultry.
S. S. Matsonia, San Francisco: 1 ct. pigeons, W. F. X. Company; 1 ct. chickens, 1 dog, James Lynch; 1 dog, T. V. King; 1 ct. poultry, Mrs. Orth.
S. S. Wilhelmina, San Francisco: 9 cts. poultry, 1 dog, W. F. X. Company.
S. S. Maui, San Francisco: 2 cts. sea galls, 1 ct. crabs, 1 ct. ducks, 1 tank fish, Wm. Wise; 1 ct. chickens, E. H. Moses, Hilo; 1 cat, Mrs. H. B. Giffard; 1 cage birds, Mrs. H. B. Giffard; 1 dog, John Mellen.
S. S. Lurline, San Francisco: 12 Holstein cows, C. W. Lucas; 1 Holstein bull, W. E. Bellina; 12 mules, H. Hackfeld & Company; 1 horse, Q. M. Department; 1 horse, Gen. Wisser.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Marketing Division

Honolulu, T. H., September 17, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I respectfully submit the following report of the Marketing Division for the month of August, 1917:

During the month, the Division has handled 194 consignments, of 30 different kinds of produce, from 91 consignors. The consignors are located on the Island as follows: Oahu, 49; Hawaii, 14; Maui, 12; Molokai, 12; Kauai, 4. Among the goods received were dressed beef, veal and pork, live cattle and hogs, Irish and sweet potatoes, dried beans, corn, grapes, bananas, onions, poultry, eggs, pohas, cabbage and watermelons.

The consignment sales for the month amounting to $11,468.15 are $1,884.68 less than the month of July, but this is to be expected as during the months of July, August and September there is not much produce to be marketed.

Our retail vegetable department made a profit of $122.32 during the month, but the butcher department lost $100.91. We have raised the prices of meats in this department in an effort to put this end of the business on a profitable basis. This leaves us a profit of $21.41 in our retail departments, and a profit of $716.63 on consigned merchandise, leaving a net profit of $738.04.

I enclose herewith, a statement of operations for the month and a copy of the general ledger trial balance.

Respectfully submitted,

O. B. LIGHTFOOT,
Acting Superintendent.

SEGREGATION OF PRODUCE RECEIVED BY THE MARKETING DIVISION DURING THE MONTH OF AUGUST, 1917.

Articles—	Total	Oahu	Hawaii	Maui	Molokai	Kauai
Avacados	477	60	417			
Bananas, bunches	554	554				
Beans, string, lbs	478	478				
Beans and Peas, dry, sacks	101		4	90	7	
Beans, wax, lbs	23	23				
Beef, dressed, head	147	8	19	79	11	30
Cabbage, lbs.	1,434	1,434				
Chickens	201	74	24	52	51	
Corn, dry, sacks	131			131		
Ducks	87	61	11	6	9	
Eggs, chicken, dozen	172	122			50	
Eggs, duck, dozen	5	5				
Grapes, lbs.	3,256		3,256			
Hides	11	7	1	1	2	
Hogs, dressed	23	6	13	4		
Honey, gals.	2	2				
Limes	1,611	200			1,216	200
Onions, sacks	55	33		22		
Papaias, lbs.	2,672	2,672				
Peppers, lbs.	55	23				
Pohas, lbs	895		895			
Potatoes, Island Irish, sacks	109	14	60			35
Potatoes, sweet, sacks	120	98			6	16
Potatoes, red sweets, sacks	65	65				
Rice, sacks	5	5				
Rabbits, live	6	6				
Turkeys	2		2			
Tallow, lbs.	111	111				
Tomatoes, lbs.	23		23			
Veal, dressed, head	20	13	2		5	

TERRITORIAL MARKETING DIVISION.

GENERAL LEDGER TRIAL BALANCE, AUGUST 31, 1917.

Furniture and Fixtures	$ 3,224.42	
Automobile	1,286.50	
Motorcycle	60.00	
Pineapple Crates	2,863.89	
Butcher Department	645.92	
Retail Department	223.02	
Seed Account	941.84	
Bank of Hawaii, Ltd	1,184.51	
Petty Cash	250.00	
Accounts Receivable	8,782.59	
Longley & Westgate	3,000.00	
Consignors' Accounts		$ 3,675.20
Vouchers Payable		428.80
Note, Bank of Hawaii		2,500.00
Revolving Fund, 1915-1917		5,194.53
Reserve for Doubtful Accounts		2,414.29
Seed Appropriation No. 190		1,839.31
" " " 206A		500.00
" " " 206B		2,192.95
" " " 206C		360.00
Revolving Fund, 1917-1919		5,588.13

Surplus		851.64
Consignment Expense		268.83
Departmental Expense	501.08	
Cost of Merchandise	8,462.45	
General Expense	3,072.55	
Butcher Sales		5,915.47
Retail Sales		3,066.20
T. Pearson & Co.		108.05
Hold Account	116.39	
Commissions		1,189.64
Cash not deposited 7/31/17	1,189.64	
" " " 8/31/17	288.24	
	36,093.04	$36,093.04

The Hawaiian Taro as Food

By Vaughan MacCaughey,
Professor of Botany, College of Hawaii, Honolulu.

The most important and distinctive crop-plant of the native Hawaiian is the *taro* or *kalo*. This valuable aroid (*Colocasia antiquorum* var. *esculenta*) occurs in many parts of the South Pacific, and in tropical Asia, and was brought to Hawaii by the early Polynesian migrants from the south. They were skilful and industrious farmers, and developed their primitive agriculture to a high state of efficiency.*

The taro plant resembles in appearance the large caladiums or "elephant's ears" common in eastern lawns and gardens. From the large, starchy, subterranean corm, (which is the part of economic value), springs a cluster of large, sagittate leaves. The corm is usually 6-12 inches long and 4 or 5 inches in diameter, like a large sweet potato. The petioles rise to a height of 2-4 feet; the blades are 10-16 inches long and 8-12 inches broad; they are bright yellow-green and so smooth that water runs off them like quicksilver. The flowers are of the typical aroid pattern, with spadix and creamy-yellow spathe, 3-5 inches high; flowers are rare and seed production is practically unknown. Taro has been propagated for untold centuries by purely vegetative methods and like many other tropical plants, (sugar cane, sweet potatoes, pineapples, bananas, etc.), has lost the seed habit.

A widely-circulated misstatement concerning Hawaiian taro is to the effect that "there are about forty varieties." In 1913 the writer, with the invaluable assistance of Mr. Joseph S. Emerson (deeply versed in the Hawaiian language and lore), made a careful survey of the native varieties and their names.† We col-

* See Agriculture in Hawaii, V. MacCaughey, Paradise of the Pacific Magazine, Dec., 1911, pp. 19-24.

† See The Kalo in Hawaii, by Vaughan MacCaughey and J. S. Emerson, published in the Hawaiian Forester in 10 installments, vols. 10 & 11, 100 pages and 20 illustrations.

lected over 300 distinct varietal names, in use among the natives. A certain proportion of these were synonyms and variants. After making all due allowances and examining the native taros themselves in hundreds of plantings, we arrived at the mature conclusion that the primitive Hawaiians cultivated and habitually recognized *over* 200 distinct varieties and strains of taro. Much of the old culture has been wholly abandoned, and many of the varieties today are very localized, or on the verge of extinction.

Some of the more important and representative varieties are indicated in the following list: *Aha-kea, Api'i, Apu-wai, Aweo-weo, Lulu, Ha'e-ha'e, Ha'o-kea, Ka'i, Koa'e, Kumu, Lau-loa, Lehua, Lola, Mana, Manini, Naio, Owene, Palai'i, Pi'i-ali'i, Piko, Poni, Uahi-a-Pele, Uluma'u, Welo-welo-la.* The choicer kinds were raised exclusively for the chiefs and nobility (*alii*) and were often spoken of as "royal taro." Other kinds were reserved for medicinal use, and for religious incantations and ceremonies.

From the standpoint of cultivation the Hawaiian taros may be conveniently classed in four groups:

1. Those raised only in upland, dryland, or unirrigated regions, *kula.*
2. Those raised only in wetlands, lowlands, or irrigated areas, *loi.*
3. Those raised both in wetlands and drylands, *loi* and *kula.*
4. Wild taros, growing in damp places and swamps in or near the forests.

The islands of Hawaii and Maui were famous in the early days for the excellence of their upland taros, whereas the islands of Oahu and Kauai, with extensive coastal plains, were devoted chiefly to the lowland kinds. Great skill was shown by the primitive Hawaiians in diverting water from the mountain streams, leading it through ditches down to the taro lands, and spreading it over the valley floors and lowlands, where the innumerable tiny patches, each surrounded by an embankment, were arranged in a veritable patchwork of low terraces.

Taro requires about one year for maturity. The corms are dug, the roots and leafy tops removed, and the corms washed. They are then thoroughly steam-cooked in a native underground oven (*imu*); this requires several hours. The cooked corms are peeled and pounded into a soft, pasty mass. The pounding is done in a long wooden trough or "poi-board," by means of stone pestles. It is a laborious process, done by the men; often two men work at opposite ends of the same board. The finished product is almost pure starch, and is called *paiai* or "hard poi." To this suitable quantities of water are added, as required, and it is thoroughly mixed. The resultant thick paste is the famous *poi* of Hawaii and the South Seas. It is a staple food in the dietary of the natives.* It ferments slightly and will keep a

* See The Food Plants of the Ancient Hawaiians, Vaughan MacCaughey, The Scientific Monthly, 4:75-80, Jan., 1917.

long time without spoiling. The natives store it in wooden bowls (*umeke*) and eat it with the fingers. Large quantities are consumed at a single meal. "Fish and *poi*" is a phrase among the natives equivalent to the American "square meal."

The succulent young leaves and petioles of the taro are cooked and eaten like spinach and comprise the delicate vegetable called *luau*. The general use of *luau* at native feasts has caused the feasts themselves to become known as *luaus*. The taro corm is also eaten as a baked or roasted vegetable, and is often mixed with breadfruit, coconut, sweet potatoes, and other foods. It is never eaten raw, because of the irritating raphides that are only dispelled by cooking.

Due to the unsanitary conditions under which hand-pounded poi is often made, many persons, especially Americans, prefer the machine-made poi. There are several factories in Honolulu; the process in brief is as follows: The corms are washed, boiled in large drums by means of live steam under pressure, and peeled by hand. The peeling is done by women, under sanitary conditions. The peeled corms are passed through a massive machine that resembles a huge meat-chopper set vertically. Water is added as needed, and the paiai, of uniform texture, comes out of the bottom of the grinder and is put into small barrels, ready for sale.

Experiments conducted at the College of Hawaii during the past year afford instructive corroboration of the well-known high food value of taro. Chemical analyses of the raw corms, conducted according to standard technique, gave the following results:

Starch	34.12%
Sugars	1.08%
Fats	1.06%
Proteins	.72%
Ash	.67%
Crude fiber	.50%
Water	59.00%

Taro has a much lower moisture content than either Irish or sweet potatoes, its fat content is higher, its protein content is lower. As to starch, taro has more than double the amount possessed by Irish potatoes, and nearly 50% more than sweet potatoes.

The starch-grains of taro are *exceedingly minute* (1/25,000 to 3/25,000 in diameter), very much smaller than those of the common cereals, for example. For this reason taro and *poi* are easily digested, and are commonly recommended for invalids, infants, and aged persons. Taro flour or "taroena," manufactured from the dried, ground corm, has been in local markets for a number of years.

With the many and profound economic changes that have tak-

en place in the Hawaiian Islands during the past century, the taro has become of rapidly decreasing importance as a food plant. The natives have diminished until there is today but a vanishing remnant of a once splendid stock*. They are the chief consumers of taro and poi; the other nationalities now dominant—American, Japanese, Chinese, Portuguese, Spanish, Filipino, etc.—use relatively insignificant quantities. It is to be hoped that taro and its products will become more generally known to Americans, not only in Hawaii, but also on the mainland, especially in the Southern States. Its simple culture, its comparative freedom from insects and fungus pests, its high yields per acre, its excellent storage qualities, its varied uses, and its extraordinary nutritive values—all combine to make the Hawaiian taro a food-plant of much interest and of large economic possibilities. This is particularly true at the present time, when the attention of the nation is focussed upon the conservation of food, and the wheat shortage places special emphasis upon the starches.

* The Vanishing Hawaiian, Vaughan MacCaughey, Pearson's Magazine, 36:337-338, Oct., 1916.

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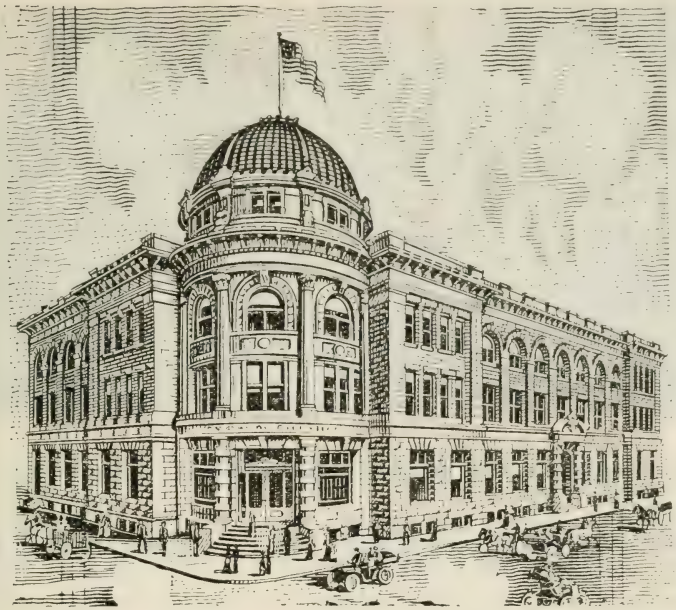
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THE HAWAIIAN FORESTER AND AGRICULTURIST

OCTOBER, 1917

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C. S. JUDD,
Superintendent of Forestry.

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THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, OCTOBER, 1917. NO. 10

Arbor Day

Arbor Day this year will be celebrated on November 16, and, as usual, there will be available at the Government Nursery for planting on this day a large supply of ornamental, shade and forest trees. These will be distributed free of charge in limited quantities to all those who are interested in tree planting. Arbor Day has usually been the occasion for improving the school grounds, and it has always been a delight to see the interest that school children have taken in tree planting on this day. It should be borne in mind, however, that interest in this subject should not cease with the mere setting of the tree in the ground. The care of the tree after planting is just as important. The watering of the tree in dry weather, the clearing of the weeds and grass from around the base of the tree, and its protection against destructive animals are all essential to have it develop into a vigorous and beautiful tree which will remain for many years a permanent and attractive addition to the school grounds.

During the past dry season we have been reminded, by the scarcity of water in many parts of the Territory, of the essential part that the forest plays in the conservation of water, and it would be fitting on the coming Arbor Day to extend the planting of trees to water-producing areas which are in need of reforestation.

Directions for obtaining trees and a list of the trees available at the Government nurseries, prepared by the forest nurseryman, are printed elsewhere in this issue.

A new bulletin by Consulting Botanist J. F. Rock was distributed during the month by the Division of Forestry. This was issued as Botanical Bulletin No. 4, on "The Ohia Lehua Trees of Hawaii," in which the trees of this genus have been reclassified after exhaustive study and placed in proper botanical order. The bulletin is profusely illustrated and is a distinct addition to the literature on Hawaiian flora.

During the month the Division of Forestry planted 2221 native koa trees on watershed areas in Manoa and Makiki valleys back of Honolulu, in following out the plan of reforesting all

open government lands on the Honolulu watershed so that they will produce the largest and most continuous supply of water possible. It is only in times of drought, like the present, that the value of pure water is fully realized, and this should be a stimulus to the owner of private forest lands to plant up depleted forest areas for the conservation of water.

Division of Forestry

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of September, 1917:

FOREST FIRES.

The dry weather continued during the month, and while there have been several small grass fires which have been promptly extinguished, only two have been reported to this office which have been of any consequence. One of these broke out on the land of Piihonua, near Hilo, Hawaii, on August 28 and covered about 50 acres of open and scrub forest land. Laborers from the Hilo Sugar Company and Hawaii Mill Company were promptly sent out by Fire Warden John A. Scott and succeeded in getting the fire under control after a few days of work. The other fire occurred in Waikapu valley, Maui, on September 16 and burned over 10 acres of waste land covered with pili grass and lantana. It was extinguished within a few hours by men working under Fire Warden Andrew Gross. Additional fire warning signs have been posted by the wardens to remind the people to be careful with the use of fire.

FOREST FENCING.

The work of fence construction on forest reserve boundaries in the region of Piha, Hawaii, has been about one-half completed, in spite of the lack of rain, which has made it necessary to pack in water for the use of the laborers.

In coöperation with this Division, Mr. F. G. Snow has completed about half a mile of fence along the boundaries of small forest reserve sections along the Volcano road near Glenwood, Hawaii, to protect the forest from wandering cattle.

The fence along the forest boundary at Hauula, which is being built by the local residents to keep their cattle from the native forest, was inspected during the month and found to be about one-half completed. The fence across three ridges and two valleys has been finished, with two valleys and two ridges remaining to be fenced. The work of setting up permanent monuments along this line at prominent points was also completed during the month.

FOREST PLANTING.

The planting of native trees on the watershed in Makiki valley has continued during the month and on government land in the reserve in Manoa valley 903 koa trees were planted out on the slopes and 112 willow slips set out in a swampy area near the boundary, making a total of 1015 trees. Several hundred trees have also been sent to Ranger Lovell for planting out on government land in the Kealia reserve, Kauai.

A consignment of seed of the nipa palm, which is of great economic use in the Philippines for the building of native houses, was received from the Director of Forestry at Manila. Some of these were sent to the Molokai Ranch for planting on the flats near Kaunakakai, a quantity was planted during the month near the shore along the windward coast of Oahu from Hauula to Makaua, and the remainder are being germinated at the Makiki nursery for subsequent distribution and planting.

After unavoidable delays, a working plan for reforesting open areas from the standpoint of water conservation, as suggested by the Hawaiian Sugar Planters' Association, has been drafted and after final revision will soon be presented for approval.

One day was spent in company with the forest nurseryman in the Ewa district for the purpose of securing eucalyptus seed not obtainable elsewhere and in examining the cuttings in the eucalyptus plantation of the Hawaiian Pineapple Company in Waipio and giving advice on the cutting of stumps and treatment of sprouts.

MISCELLANEOUS.

Another visit was made during the month to the Island of Kapapa, in Kaneohe Bay, in company with Mr. J. F. Stokes of the Bishop Museum, who gave valuable advice on the protection of native birds. A sign was placed on the island which calls attention to Rule IV of this Division. On the same day an attempt was made to land on the Island of Kekepa, which is a continuous nesting place for petrel and other native birds, but had to be abandoned on account of the high surf that was running.

During the early part of the month Botanical Bulletin No. 4, "The Ohia Lehua Trees of Hawaii," by Consulting Botanist J. F. Rock, was received from the press and issued.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, September 30, 1917.

Superintendent of Forestry, Honolulu, T. H.

DEAR SIR:—I herewith submit a report of the principal work done during the month of September:

NURSERY.

Distribution of Plants.

	In Transplant Boxes.	Pot Grown.	Total.
Sold	100	329	429
Gratis	1150	358	1508
Total	1250	687	1937

COLLECTIONS.

Realizations.

Collections on account of plants sold amounted to	$ 5.75
Rent of office building, Nursery grounds, for July	35.00
Total	$40.75

Preservation of Forest Reserves.

September 30:

Rent of premises at Half-way House, Tantalus, July, August, September	$30.00
Fee for use of land and gathering ti leaf, Pauoa valley, July, August, September	12.50
Rent of small piece of land, Pauoa valley, April, May, June	.75
Trustee, Parker Ranch—Rent of 73 acres of land in Hilo forest reserve, near Keanakolu, August 12, 1917, to August 12, 1918	39.50
Joe Goes—1 load black sand from Makiki sand pit	.25
Okada—6 loads black sand from Makiki sand pit	1.50
Schigei—4 loads black sand from Makiki sand pit	1.00
Takemoto—1 load black sand from Makiki sand pit	.25
Takemoto—1 load black sand from Makiki sand pit	.25
Total	$86.00

MAKIKI STATION.

The work at this station has been principally routine. Large quantities of plants of many species are now ready for the coming planting season.

HONOLULU WATERSHED PLANTING.

During the month 1318 koa trees were planted out around the top of Makiki main valley and the rocky land on the east side of the valley.

ADVICE AND ASSISTANCE.

During the month the writer paid visits and otherwise gave advice and assistance as follows: Calls made, 6; advice by letter, 5; advice by telephone, 12; advice given at Nursery, 13.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, September 30, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of September, 1917, as follows:

During the month there arrived at the port of Honolulu 43 vessels, of which 22 carried vegetable matter, consisting of the following:

Disposal.

	Lots.	Parcels.
Passed as free from pests	831	34,408
Fumigated	4	4
Burned	18	22
Returned	1	3
Total inspected	854	34,437

Of these shipments, 34,195 packages arrived as freight, 149 packages as baggage of passengers and immigrants, and 93 packages as mail matter.

RICE AND BEAN SHIPMENTS.

During the month 50,964 bags of rice and 6493 bags of beans arrived from Japan and Oriental parts and after careful inspection were found free from pests.

PESTS INTERCEPTED.

Approximately 3638 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and from the same were seized and destroyed by burning 8 packages of vegetables and 13 packages of fruit.

On September 21, two orchids in the baggage from Sydney, N. S. W., were fumigated as a precaution and the soil removed.

Also one package of seeds and spices from Singapore found in the baggage was fumigated with carbon bisulphide before delivery, as the seeds were infested with weevils.

On September 26 a package of palm seeds arrived by mail from Italy which showed work of a lepidopterous larva, and the seeds were fumigated before delivery.

On September 29 we found two dwarf pine trees in the baggage from Japan and these were refused entry. We also seized a package of bulbs and, as these were not called for by the party, they were destroyed.

A package of peach pits was found in the mail from Japan and was returned as contraband.

Two packages of beneficial insects arrived from Manila for the H. S. P. A., and all soil and packing material was, as usual, burned by this department.

HILO INSPECTION.

Brother M. Newell reports the arrival of five steamers and three sailing vessels. Of the steamers, three carried vegetable matter, consisting of 167 lots and 2468 packages of fruits and vegetables; all were passed as free from pests. By mail, one package of plants had to be fumigated on account of mealy bug infestation. The three sailing vessels brought lumber.

KAHULUI INSPECTION.

Mr. Edwin C. Moore, fruit inspector, reports the arrival at Kahului of seven vessels, five steamers and two sailing vessels. Three steamers brought vegetable matter, consisting of 13 lots and 767 packages, of which three boxes of turnips were dumped at sea on account of being infested with the radish maggot.

INTER-ISLAND INSPECTION.

Fifty-eight steamers plying between Honolulu and other Island

ports were attended to and the following shipments were passed as free from pests:

Taro	455	bags
Vegetables	256	packages
Plants	108	packages
Fruit	20	packages
Total inspected	839	packages

Four packages of plants and two packages of fruit were seized and refused shipment on account of infestation and undesirable soil.

Respectfully submitted,

E. M. EHRHORN,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, September 30, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—During the month of September the insectary handled 20,700 pupae of the melon fly, from which there were bred 496 females and 472 males, *Opius fletcheri*.

The distribution of parasites was as follows:

	Females.	Males.
Opius fletcheri.		
Oahu:		
Moanalua	260	250
Waikiki	85	80
Sheridan Street	95	60
Tetrastichus.		
Oahu: Keeaumoku Street	200	
Chalcid.		
Oahu:		
Moanalua	500	
Kalihi	200	
Diachasma tryoni.		
Oahu:		
Keeaumoku Street	110	115
Pawaa	50	20

Galesus.

Oahu: Keeaumoku Street	75	100

Diachasma fullawayi.

Oahu:		
Keeaumoku Street	30	25
Pawaa	20	15

Paranagrus (Corn Leaf Hopper Parasite).

Oahu: Makiki Nursery	1200

Very respectfully,

DAVID T. FULLAWAY,
Entomologist.

Division of Animal Industry

Honolulu, October 16, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I have the honor to submit herewith the following report of the Division of Animal Industry for the month of September:

TUBERCULOSIS CONTROL.

Owing to the rush of other business this work has fallen somewhat behind, but is being taken up as rapidly as conditions will permit.

The following animals were tested during the past month:

T. F. Farm—Tested, 6; passed, 6; condemned, 0.

Besides the above, a total of 230 head were injected for C. H. Bellina, the results of which will appear in the October report.

ANTHRAX.

While on the mainland many outbreaks of this dread cattle disease are occurring in different places, and especially in California, the usual intensity of which would indicate a malicious origin, the disease in this Territory may now be said to be under absolute control and there is little danger of further outbreaks unless through deliberate "plant."

On Oahu no deaths from anthrax have occurred since July 1; on Maui since August 4, and on Kauai since August 24.

Although considerable opposition was aroused in certain quarters against the disposal and future use of the Farm animals, nevertheless, a very successful auction was held at the special quarantine station, at which there was no lack of bidders, and a keen demand for this stock was very manifest, as a result of which a very fair price was obtained.

The meat and milk from these dairy animals is as safe for human consumption at the present time as it ever was before the outbreak occurred. As a matter of fact, the stock sold at auction never had anthrax. All those which developed the disease died; the balance, being protected from the infection by vaccination, never, in any way, developed anthrax. These animals are now immune, which immunity will continue for some months longer.

Taking into consideration the present favorable conditions, the repeal of all special anthrax quarantine rules and regulations, now investing the islands of Oahu and Maui, has been advised, thereby allowing the free inter-island shipment of live stock without permit except such as may come from the infected areas on Maui. Said stock shall be subject to inspection and be accompanied by a permit signed by the deputy territorial veterinarian.

While no more deaths have occurred on any of the islands concerned, and while we have the disease under entire control, the fact that we still have the infection firmly implanted in our soil must not be lost sight of. It is only by the utmost vigilance and constant use of vaccine that we will be able to maintain control, prevent further outbreaks and finally eradicate the disease.

CONTAGIOUS EPHITHELIOMA.

This disease of chickens seems to be less prevalent this season than for some years past, which may, in part, be attributed to the liberal use of vaccine. If all poultry raisers will continue the practice of immediate vaccination on the appearance of the disease, little loss will be experienced and we may hope to eventually eradicate it from the Territory.

IMPORTATIONS OF LIVESTOCK.

S. S. Makura, Vancouver: 1 dog, Mrs. B. Darken.

S. S. Matsonia, San Francisco: 1 dog, W. F. X. Co.; 1 dog, Lieutenant Gunn; 1 dog, C. H. Smith.

S. S. Maui, San Francisco: 1 dog, Geo. E. Barnes.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Marketing Division

Honolulu, October 15, 1917.

Board of Commissioners, Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I respectfully submit the following report of the Marketing Division for the month of September, 1917:

The Division has handled 156 consignments, consisting of 40 different kinds of produce from 75 different consignors. A list showing the produce received from the different islands, and the quantity, is enclosed herewith.

While the number of consignments handled during the month was smaller than for August, the consignment sales were $702.42 greater.

Both retail departments lost during the past month. Prices have again been advanced and a new man put in charge of the butcher department.

Practically all the Maui beans have been sold. Some rather large shipments of corn have been received and sold at good prices. Sweet potatoes have been sold in large quantities, quite a few of them being shipped to Hilo.

There has been some criticism of the Marketing Division recently, because it has done nothing to decrease the high cost of fish. Although the Division is not equipped with the special counters and ice boxes necessary for handling fish, I can see no objection to trying to help the situation, at least in a small way. As far as I can find out, there are very few independent fishermen, and if the Division depended on these few for a regular supply in order to build up a trade, I am of the opinion that the attempt would be a failure and the Division more severely criticized than at present.

I enclose herewith statement of operations for the month, showing a net profit, and a copy of the general ledger trial balance.

Respectfully submitted,

O. B. LIGHTFOOT,
Acting Superintendent.

SEGREGATION OF PRODUCE RECEIVED BY THE MARKETING DIVISION DURING THE MONTH OF SEPTEMBER, 1917.

Articles:	Total	Oahu	Hawaii	Maui	Molokai	Kauai
Avocados	760	..	760	..	..	..
Bananas, bunches	432	432	..	..	..	..
Beans, string, lbs.	27	22	5	..	..	..
Beans, dry, sacks	35	..	13	22	..	..
Beans, wax, lbs.	28	28	..	..	..	..
Beef, dressed, head	119	3	19	95	2	..
Cabbage, lbs.	576	576	..	..	..	..
Chickens	58	43	15	..	..	..
Coffee, tons	2	..	2	..	..	..
Corn, cracked, sacks	19	..	..	19	..	..
Corn, dry, sacks	16	..	..	16	..	..
Corn, green, doz. ears	6	..	6	..	..	..
Corn meal, lbs.	40	..	..	40	..	..
Cucumbers, doz.	15	15	..	..	..	..
Ducks	76	65	11	..	..	..
Eggs, chicken, doz.	175	64	30	..	81	..
Eggs, duck, doz.	4	4	..	..	..	..
Grapes, lbs.	370	..	370	..	..	..
Guavas, lbs.	500	..	500	..	..	..
Hides	9	8	..	..	1	..
Hogs, dressed	28	7	11	8	2	..
Lemons	250	250	..	..	..	..
Limes	5080	300	..	210	4270	300
Ohelo berries, lbs.	650	..	650	..	..	..
Onions, crates	15	..	..	15	..	..
Oranges	450	450	..	..	..	..
Papaias, lbs.	1899	1899	..	..	..	..
Peanuts, lbs.	75	75	..	..	..	..
Peppers, lbs.	35	35	..	..	..	..
Pohas, lbs.	689	..	689	..	..	..
Potatoes, Island Irish, sacks	63	62	..	1	..	..
Potatoes, white sweets, sacks	153	149	..	..	4	..
Potatoes, red sweets, sacks	21	21	..	..	..	..
Pumpkins, lbs.	301	..	54	..	247	..
Rabbits, live	12	12	..	..	..	..
Rice, sacks	10	10	..	..	..	..
Tomatoes, lbs.	22	..	22	..	..	..
Turkeys	37	1	36	..	..	..
Veal, dressed, head	10	5	2	..	3	..
Watermelons	1320	..	..	1320	..	..

GENERAL LEDGER TRIAL BALANCE, SEPTEMBER 30, 1917.

Furniture and fixtures	$ 3,224.42	
Automobiles	1,286.50	
Motorcycle	60.00	
Pineapple crates	2,627.70	
Butcher Department	376.29	
Retail Department	187.11	
Seed Account	647.35	
Bank of Hawaii	3,486.51	
Petty cash	250.00	
Accounts receivable	8,786.78	
Longley and Westgate	3,000.00	
Consignors' Account		$ 4,528.47
Vouchers payable		1,320.90
Note, Bank of Hawaii		1,500.00
Revolving Fund, 1915-1917		4,913.44
Reserve for doubtful accounts		2,414.29
Seed Appropriation 190		1,389.04
Seed Appropriation 206A		750.00
Seed Appropriation 206B		3,142.22
Seed Appropriation 206C		560.00
Revolving Fund, 1917-1919		5,604.91
Surplus		807.79
Consignment expense		365.89
Departmental expense	713.02	
Cost of merchandise	12,658.76	
General expense	4,556.96	
Butcher sales		8,827.54
Retail sales		4,276.39
Hold Account	87.53	
Commissions		1,808.01
Cash not deposited on Sept. 30, 1917	265.96	
	$42,208.89	$42,208.89

Mr. A. J. W. Mackenzie of 29 Miles, Olaa, Hawaii, has been appointed forest ranger to look out for the forest reserves in South Hawaii, and assumed his new duties on October 1, as a successor to Francis B. Dodge, who left the employ of this Board to join the U. S. Navy. Mr. Mackenzie is well qualified for the position and will be concerned chiefly in repairing and building fences and in preventing damage by trespass and fire.

Arbor Day

Honolulu, October 29, 1917.

Editor, Forester and Agriculturist, Honolulu.

SIR:—Will you kindly inform your readers that the Division of Forestry will be glad to supply trees as usual for Arbor Day, November 16?

Trees will be available at the Government Nursery in Honolulu and also at the two sub-nurseries, one in Hilo, Hawaii, and the other at Homestead, Kauai. The nursery at Hilo is under the charge of Brother Matthias Newell and the one at Homestead, Kauai, under the charge of Mr. Walter D. McBryde. People living within a reasonable distance of the sub-nurseries should apply direct.

To allow time for the trees to arrive at their destination before Arbor Day, all orders from Hawaii, Kauai, Maui and Molokai, addressed to the Government Nursery, Honolulu, should be in our hands not later than November 5. Orders from Oahu and the district of Honolulu should be in our hands not later than November 10.

Trees will be shipped f. o. b. to any port where freight is delivered by the Inter-Island Steam Navigation Company, also to stations on the O. R. & L. Co.'s line.

People living within the district of Honolulu who desire trees will be required to call at Nursery for same.

Trees will be ready for delivery if previously ordered on and after November 14. All trees ordered but remaining uncalled for at the Nursery will be turned back into the regular stock on November 24.

Appended is a list of the trees available for Arbor Day at the Government Nursery, Honolulu.

Yours very truly,

DAVID HAUGHS,
Forest Nurseryman.

TREES AVAILABLE FOR ARBOR DAY, 1917.

Common Name.	Scientific Name.
Golden Shower	*Cassia fistula*
Pink Shower	*Cassia grandis*
Pink and White Shower	*Cassia nodosa*
Royal Poinciana	*Poinciana regia*
Yellow Poinciana	*Peltophorum ferrugineum*
Jacaranda	*Jacaranda mimosaefolia*
Christmas Berry	*Schinus terebinthifolius*
Pepper Tree	*Schinus molle*

Common Name.	Scientific Name.
Monkey Pod	*Pithecolobium Saman*
African Tulip Tree	*Spathodea campanulata*
St. Thomas Tree	*Bauhinia tomentosa*
Silk Oak	*Grevillea robusta*
Ironwood	*Casuarina equisetifolia*
Japan Cedar (Sugi)	*Cryptomeria Japonica*
Blue Gum	*Eucalyptus globulus*
Lemon Gum	*Eucalyptus citriodora*
Swamp Mahogany	*Eucalyptus robusta*

Each applicant is entitled to 24 trees free of charge.

The History and Development of the Live Stock Industry of the Territory

By Leonard N. Case, *Assistant Territorial Veterinarian.*

INTRODUCTION.

It was with considerable hesitation that I accepted the kind invitation of your chairman to prepare a paper on the live stock industry of this Territory. At all times a subject of vital interest, it now assumes, under the unusual conditions in which the United States finds itself, an importance of primary consideration in the conservation of the resources of this Territory.

Being situated many miles away from the mainland, the question as to how far we can become self-supporting is of paramount importance. The improvement and conservation of our domestic animals means the conservation of a very important part of the food supply of the people and, in turn, the conservation of human health and life, which should be and is the highest aim of any scheme of conservation.

I will endeavor, in the limited time at my disposal, to give some idea of the general history and development of the live stock industry of this Territory, with special reference to the meat supply, touching also various other fields open to the breeder, and finally mentioning a few of the lines along which future development should be expected.

GENERAL HISTORY OF THE LIVE STOCK INDUSTRY OF THIS TERRITORY.

The early history of live stock in these Islands is veiled in obscurity. It is known that fowl and swine were present on the Islands when Captain Cook made his first visit, but there are no records as to how they came to be here.

The first cattle were brought to the Islands by Vancouver in 1793 and were deemed of sufficient value to be protected by royal decree for a period of ten years, only the excess males being slaughtered. The records do not state what particular breed or breeds were represented in this importation.

The first record we have of the introduction of pure-bred stock into these Islands is in the eighties, and three men were principally responsible. J. I. Dowsett was the first, he importing a small herd of Polled Angus. This importation was followed by a small herd of Holstein Friesan cattle from Germany by Judge McCully, to be followed shortly after by a herd of Shorthorns introduced by James Campbell.

This was a small beginning; too small, in fact, to make much impression on the existing heterogeneous mass of native stock. Still, it was a step in the right direction, and we are now receiving the benefit of the impetus given the live stock industry by these men.

Still progress was slow. There seemed to be no concerted effort on the part of breeders to systematically improve their herds. There was considerable discussion as to what breed of beef or dairy cattle was best fitted for the peculiar climatic conditions obtaining here, without due consideration given to the fact that certain breeds might do better in certain localities than others and that it was not entirely necessary that any particular breed be picked out to stock the entire Territory.

After a period of uncertainty there was finally made an attempt to organize the chaotic conditions which had previously existed. It had become apparent to a number of the foremost breeders of live stock that, if anything worth while was to be accomplished, organization was necessary, and so, in the early part of 1902, the Hawaiian Live Stock Breeders' Association was formed, the purpose of said organization being the development and improvement of all live stock industry in the Territory, the introduction of new pasture grasses, and the preserving and restoring of such forest growth as might be beneficial to grazing lands.

This organization started in well, its various members showing considerable interest and enthusiasm. It laid the foundation of our present system of breeding, and it is to be regretted that it was unable to keep on with the good work. Such an organization made up of the foremost breeders is of incalculable value in the development of the live stock industry of any country. Its members are given the opportunity of getting together for the presentation and discussion of their various ideas and problems and the circulation of valuable experiences. Such an organization being at all times in touch with similar organizations on the mainland and in foreign countries, its library is replete with books and magazines bearing on the subject of live stock breeding and allied industries, knowledge of the greatest value to those engaged in such work.

We are confidently looking forward to the time when another Hawaiian Live Stock Breeders' Association will be formed. I feel that then and only then will the highest point in the live stock industry of this Territory be reached.

PRESENT SYSTEM OF BREEDING.

Breeding is an art; there is nothing haphazard about it. Great breeders, like great poets, are born, not made. Few can achieve the signal success of Bates, Bakewell, Booth Bros. and Colling Bros., nor is it necessary that all should, but to achieve any degree of success, certain laws in breeding must be followed and a certain type held in view; otherwise it is time and money wasted. The breeder must have a keen eye for details, be able to note unerringly the various characteristics desirable in the type he has in mind, and use only those animals for breeding whose prepotency is such as to stamp their offspring with those desirable characteristics.

The past ten years has seen great advances in practically all lines of animal industry in this Territory. Hundreds of pure-bred animals of all classes have been imported from the mainland, New Zealand and Australia. These have made and are making their impress on the various herds, and it is through this means that the old native stock is being rapidly replaced until it is rare now to find any of the old type, if we may so misuse the term, and on many ranches they have entirely disappeared.

Live stock breeders in this Territory have awakened to the fact that it is much more profitable to breed high-class animals than scrubs, and so they are every year importing the very best type of pure-bred stock in ever-increasing numbers.

The importation of this class of breeding stock and the raising of pure-bred and high-grade animals is the one and only solution of the problem confronting us, i. e., whether or not this Territory can become self-supporting so far as animal products are concerned.

Every year more and more land is being taken up for homesteading purposes. This land is coming from the various plantations and ranches, and as far as the ranches are concerned it means that fewer animals can be kept. How, then, is the increasing demand for meat and dairy products to be met by breeders? Simply by the increased quality, condition and earlier maturity of the one, and increased productivity of the other, both depending upon the use of the highest type of pure-bred stock according to the class.

It will be seen, then, that the present system of breeding consists largely of the introduction of increasing numbers of pure-bred stock, which are steadily changing the entire conformation of all the herds in the Islands, until now there is no comparison

with the herds existing ten or fifteen years ago. More and more attention is now given to type, and more care is being exercised in picking out animals which conform most nearly to the ideal held in mind by the breeder. We have gotten to the stage where it is not solely sufficient that the animal be pure bred, but it has got to answer to certain specifications recognized as correct by the breeder according to the particular class of animals he is raising.

The larger percentage of valuable characteristics is transmitted to the offspring through the male, and so it must be borne in mind when picking a sire that he must have all or nearly all the desirable characteristics, and, above all, be able to transmit the same to the greater number of his offspring. It is in the determination of this quality of prepotency that the pedigree is of the most value. A pedigree may be yards long and still, if it contains a heterogeneous group of ancestors, be absolutely valueless and the animal therein described of no use from the breeder's standpoint. That pedigree only is of value in which the blood lines are as nearly perfect as possible; that is to say, one in which the blood of the greatest sire of that particular breed occurs frequently and in which all sires show unusual prepotency. A sire with such a pedigree is the most desirable, whether it is to be used in a grade or a pure-bred herd.

OBJECTIVE POINTS IN BREEDING.

The objects in breeding are various. We will take up those fields in which this Territory is most vitally interested and in which it should be self-supporting.

The Meat Industry. As far as meat is concerned, the Territory has gone far toward supplying its demand; especially is this true of beef and pork. The great advance which has been made during the past ten or twelve years in the production of high-class beef, mutton and pork is not generally realized by the public.

Hundreds of the highest type of pure-bred animals in these three classes have been imported for this purpose, and the work of improvement and breeding has gone steadily on until now we can and are producing in this Territory as high class meat as anywhere in the world.

In order to obtain an adequate idea of the improvement which has taken place in the line of meat production, it is necessary to go somewhat into detail.

In 1902 the following cattle and sheep were killed in Honolulu:

	Average Dressed Weight per Carcass.	Average Price per Carcass.
No. Cattle: 4998	422.7 lbs.	$40.10
No. Sheep: 8352	33.44 "	3.12

The following amounts of frozen beef, lamb and mutton and dressed poultry were imported:

	Quantity.	Value.
Beef	1,170,153 lbs.	$104,303.45
Lamb and mutton	320,260 "	31,536.96
Poultry	116,824 "	19,331.16

The above figures readily show that little attention was given to cattle and sheep raising. The cattle slaughtered here were of inferior quality and condition; in short, they showed neither breeding nor care. They were entirely grass fed and at that time little attention was given to the improvement of the range. They matured slowly, it taking four years and over to bring them to marketing condition.

These conditions remained the same for a number of years until a few of the most interested awoke to the fact that it would pay them to improve their herds, and so the importation of pure-bred stock commenced in earnest.

The effects of these importations were soon apparent, and by 1912 the average dressed weight of cattle killed at the principal slaughter-house in Honolulu rose to 490 pounds. This meant an increase of 68 pounds per carcass, or a total extra production for the number killed, of 680,000 pounds of beef, with a valuation at the then market price, which had remained practically unchanged, of $64,600; and this being due entirely to improved breeding, feeding and care.

It must not be imagined that this improvement was general throughout the Territory. It was not. There still remained a number of herds in their unimproved state, but it goes to show what was taking place. Live stock breeding had received the stimulus necessary to bring it to the position where it could supply the steadily-increasing demand for a high-class article.

There is not a ranch in the Territory today but what shows to a greater or less extent the effects of systematic breeding. The ranches today are in a better condition to carry stock than ever before. Proper methods of fencing and paddocking have been established and the lands cleared, plowed and sown with the best grass seed. What have been the results? We now have cattle ready for the block in three years and earlier; the average dressed weight is 590 pounds per carcass, or an increased weight gained in the last five years of 100 pounds per carcass, which means that, for the number killed from August, 1915, to August, 1917,

there was an extra production of 1,200,000 pounds of beef, which at the present market price means that the breeders have received an extra $168,000. This is what has been accomplished in this line during the past few years by the application of modern scientific principles of selection and breeding, together with close attention to feeding and care.

Still, with all this increase it was necessary to import from the mainland over 590,000 pounds of fresh beef to satisfy the demand of our rapidly-growing population. However, these importations are steadily decreasing in amount, and very shortly will be unnecessary.

There is not the same record of improvement in lamb and mutton production. The average dressed weight per carcass has increased but slightly. In 1905 there were about 100,000 sheep in the Islands, yet the Territory could not supply its demand, and over 3000 carcasses of mutton, valued at a little over $13,000, were imported.

If we hope ever to supply this demand more attention to sheep tory is a trifle over half what it was ten years ago, and the demand for lamb and mutton, although light at present, is still far in excess of what it was at the above period, due to the great increase in the population and the presence of large contingents of the army.

This decrease in numbers is partly offset by increased quality due to better breeding and attention.

If we hope ever to supply this demand, more attention in sheep husbandry must be given than ever before. It is true that a considerable number of blooded rams have been imported in the last few years, but the wool breeds have been far in excess of the mutton breeds. More of the mutton type will have to be imported and more attention given to proper paddocking and the sowing of the most nutritious grasses; and see to it that the ranges are not over-stocked. Being entirely grass-fed, their condition varies with the changing climatic conditions. Special feeding will largely do away with this. We cannot successfully compete in the open market against specially fed lamb and mutton with a 35 to 37-pound grass-fed carcass showing neither quality nor condition.

These conditions can be altered only by breeding and feeding. Sheep have always been profitable to those breeders who took sufficient interest in it. Sheep raising cannot be expected to prove profitable when it is taken, as it is here by many, as a secondary consideration. There are conditions existing here which can be met only by proper feeding. Analyses show that the soil in certain areas is deficient in lime salts, with a consequent shortage of lime salts in the grasses. These lime salts furnish the bone-building material absolutely necessary for the proper development of the young and the keeping in condition of the pregnant animal. This applies to all classes of animals alike.

This aspect of the breeding situation has been fully and extensively gone into by Dr. Nörgaard in his various reports. He has pointed out the remedy and its proper application, and if these instructions are conscientiously carried out, the question of breeding high-class animals in this Territory will be solved.

Wool is grown here for export only. During the eleven months ending May, 1915, 97,686 pounds were exported, at a valuation of $13,687; for the same period ending May, 1916, 55,222 pounds, valued at $9190; and for the same period ending May, 1917, 181,188 pounds, valued at $31,631.

There is no doubt that a superior grade of wool can be grown here if sufficient time and attention is given to it, and it can well be made a source of considerable revenue to the Territory.

The Territory has been able to supply its fresh pork demand for a number of years; in fact, since 1909. The pork produced here is of a superior quality and the character of the breeding stock imported points to a continuation and steady improvement of this high standard of production. No frozen pork is now being imported, as the consumer much prefers the local product.

The production of pork would seem to be a very attractive field, especially so now, as the prices are the highest ever paid, producers getting from 19½ to 20 cents a pound live weight, compared to 10 and 11 cents before the war.

That this is appealing to many is evidenced by the fact that more and more people are keeping hogs. Because of the stationing of large numbers of soldiers here, a great quantity of kitchen refuse is available for hog feeding. It makes an excellent, cheap feed, but must be used with considerable care, otherwise various digestive troubles are apt to occur. There is considerable slaughter-house offal available for this purpose, a good deal of which is being wasted at the present time. These feeds, combined with green feed which can be produced here, together with a little bone meal and molasses, is all that is necessary for the successful production of pork. The prices of imported grains are too excessive to allow of their use in this connection, but grains which can be grown here could be used to great advantage.

Methods of pasturing hogs on fields sown to alfalfa and other feeds have never been practised here, but it is well worthy of a trial, as very beneficial results have been obtained by this means on the mainland and in other countries.

The Dairy Industry. The dairy industry has not kept pace with the improvement noted in other lines of animal husbandry. The scrub dairy cow is still much in evidence and will probably so remain until the general run of dairymen are educated up to the fact that it costs as much to keep a well-bred, highly productive animal as it does a scrub, besides being vastly more profitable. When this point is reached there will be a considerable demand for the best type of dairy animal, which demand should

be met by the breeders in these Islands. Some of the ranchers are already taking up the breeding of blooded dairy stock and will soon be in a position to furnish a considerable number.

A few of the dairymen are importing good cows, but there should be more. A dairy record of each cow should be kept, as this is the best means of telling whether or not an animal is producing a profit. If it is not, get rid of it at once and replace it with one which does, because at the present price of feeds you cannot afford to keep it.

Scarcely any milk testing is done, and it should be done at each dairy at intervals, in order to obtain a knowledge of the fat content in the milk as a whole and, if it is falling below the standard, individual tests should be made so as to intelligently discard those animals giving an inferior product.

The sanitary condition of the dairies, although showing much improvement over conditions existing a few years ago, still show room for considerable further improvement. The dairies are not all in the same class, some showing considerable improvement in the sanitary surroundings, as in the class of cattle used, while others show practically no improvement.

Sanitary conditions will not greatly improve until there is competent and uninterrupted dairy inspection. The dairymen as a whole have always been found willing to comply with any reasonable request, but they can hardly be blamed for becoming incensed at being treated with new ideas and different treatment every two years.

As far as fresh milk is concerned, the Territory entirely supplies the local demand, but canned milk, fresh cream and butter still continue to be imported in ever-increasing amounts, one dairy concern alone importing so far this year 5000 gallons fresh cream and 12,730 lbs. of fresh butter. When the dairy animals of this Territory are bred up to and fed up to the standards of what a dairy animal should be and should be able to produce, the Territory will have become self-supporting so far as the dairy industry is concerned.

Production of Working Stock. There is a considerable demand for both horses and mules for plantation, city and country work, and this demand has in the main been supplied by importations from the Coast. That this Territory can supply this class of animals was fully demonstrated by the various exhibits at the Hilo and Maui county fairs.

Mainland horses and mules are bringing excellent prices, due to the large demand made on the visible supply by the warring nations. That the ranches here are taking advantage of this and are making an effort to supply the local demand is evidenced by the fact that fewer animals of this class, especially horses, were imported during 1916 than for some years back. The demand is here and the ranches are in a position to breed the right kind of stock, and in a short time will be able to furnish the entire supply.

Army Remounts. This is a field recently opened to breeders in these Islands. Every year a certain number of horses are in demand by the various organizations stationed here as remounts, and this demand should be supplied by the Territory and a remount service station established here.

A considerable number of Hawaiian-bred horses have already been purchased by army officials, and further purchases are contemplated in the immediate future. These horses have in the main proved satisfactory, still there is room for considerable improvement.

Certain standards have been set up by the army, and their live stock must follow closely the recognized specifications for each organized unit, and those breeders who desire to take advantage of the market afforded them should make themselves familiar with the regulations on the subject and endeavor to produce the type of animal desired by army officials and place before them the best from which to pick.

As far as the artillery horse is concerned, there is probably enough material of the right kind here at present to supply the demand. As to the cavalry horse, there are perhaps sufficient mares of the right type, but there should be introduced a few more thoroughbred stallions as heavy-boned as it is possible to get and not show coarseness. Light and heavy artillery horses and cavalry horses suitable for army use as remounts should bring $225 to $250 for the former and at least $175 for the latter.

The animals so far furnished to the army are all that could be desired as far as looks and general conformation are concerned, but a certain percentage have not shown the necessary stamina. Five and six-year-olds are best adapted for army use. Nothing over eight years can be considered. Young horses furnished from remount depots have to go through a careful course of training, which training lasts until they qualify fully for the ranks; otherwise they cannot stand up under the strain incident to the work required.

The market is here and the live stock breeders in this Territory should take advantage of it, but they must produce an animal fully meeting the requirements, otherwise the army must look elsewhere.

Polo and Racing. The only sports of paramount interest as far as animal industry is concerned are polo and racing. For a number of years keen interest has been taken in polo, but the revival of the racing spirit is comparatively recent. This keen interest found expression in the organization of the Hawaii Polo and Racing Club, which will have the greatest influence in the future development of the above sports. It will lead to the importation of thoroughbreds in increasing numbers, and already twelve such stallions and mares have been imported for the improvement of stock already here.

There is no one thing which will give the necessary stimulus to this branch of animal industry as the keen competition between the polo teams of the different islands and the racing stock of the various ranches. The records are eloquent in establishing the fact that both classes of animals can be bred and raised in these Islands. These two sports should be encouraged on every hand, not alone for the interest they stimulate in spectators and participants, but as a means par excellence of promoting horse raising in this Territory.

CONCLUSION.

In concluding allow me to mention briefly a few lines along which future development should be expected.

In the eleven months from June, 1916, to May, 1917, there were imported into the Territory canned beef, bacon and hams totaling 1,616,735 pounds, having a total valuation of $368,166. These products could and should be produced here. Experts in this line could be obtained and a suitable building erected. The above figures would seem to show an agreeable margin of profit.

In the above-mentioned period, dressed poultry to the value of over $90,000 was imported; also, over 36,000 live chickens and turkeys for slaughter. Little interest has been taken in the raising of poultry either for meat or for egg production. The climatic conditions are unexcelled, and there is a freedom from poultry diseases here not found in many parts of the world. The most serious menace, contagious epithelioma, can now be controlled through vaccination. The present high price of feeds has no doubt exerted considerable restraining influence.

Grain feeding of cattle and sheep for the market has never been undertaken here to any extent. It is a field for future development and offers a valuable means of rounding out underweight stock and tiding over a period of drought. The best grass-fattened cattle slaughtered here compare very favorably with the specially market-fed cattle elsewhere, and are as a rule superior to grass-fed cattle on the mainland. This method of finishing cattle and sheep will undoubtedly be taken up by some of the ranches in the near future.

In this connection it may be stated that a system of grading beef according to the quality and condition should be established, together with a corresponding scale of prices. By doing this the breeder will receive the full value he is entitled to according to his efforts to improve his stock.

As homesteading is being considered more and more and a greater amount of land being devoted to that purpose each year, it would appear that the homesteader could add materially to his profit if he kept a few good cows. Such cows would not only be required to produce milk, cream and butter in good supply, but should be expected to raise a calf each year that could

profitably be utilized in consuming the grass and roughage of the farm or homestead. They should be, for general homesteading purposes, of a beef and milk-producing breed, so that the males will command a fair price as yearlings and two-year-olds for slaughtering, and the heifers the requisite size and quality to be retained for breeding.

The above requisites are met with in the milking strain of shorthorns more than in any other breed. They have been bred to give a large quantity of milk of good quality, and when they are no longer profitable as milkers they can be fattened easily and bring a considerable profit as beef. Excellent examples of this breed may be seen at the Alexander Young dairy, where they have been in use for some years. They are cattle well worthy the consideration of the present and future homesteader.

A word about fairs. The part played by county, state and territorial fairs in the promotion and development of all branches of agriculture cannot be overestimated. They have helped, more than any other one thing, to build up and maintain our present high agricultural standards.

From our occasional dog and poultry show has evolved the idea of a county fair in which shall be represented the varied industries of these Islands. The people of this Territory have now fully awakened to the immense advantages of such fairs as a means of advertising and displaying in concrete form the results of individual effort in all branches of industry. The friendly rivalry and competition for prizes will, more than anything else, stimulate increased activity in all branches of agricultural and mechanical art.

We have held two such fairs, and they have exerted great influence on the animal industry here. Practically all exhibits were features in themselves, but the one which, perhaps, created the most interest, and which was also a source of considerable astonishment to many, was the exhibit of Hawaiian-bred live stock of various classes. This exhibit included several pure-bred, pedigreed Hereford bulls, bred and raised on the Parker Ranch and representing some of the best blood to be found in the United States. As far as individual merit is concerned, they would be hard to beat in any competition on the mainland. Considering that the live stock industry is only in its infancy, the results so far obtained are simply marvelous and go to show that we are fast nearing the time when we can supply our own demand for pure-bred registered stock.

Another exhibit at the Hilo county fair of considerable interest and economic importance was the display of various kinds of forage raised on the different homesteads, particularly those of Haiku, Maui. Various varieties of legumes were represented, the beans being made into coarsely and finely-ground meals and the roughage into baled hay with a palatability and nutritive

value equal to, if not greater than, alfalfa. Already experiments have shown that all horse stock prefer these hays to those imported from California, which they only eat when there is nothing else. This new industry would seem to open another avenue of profit to the homesteader.

In passing, it may be said that the county fair has come to stay. It has done much and will do more to promote and develop the various industries established here and to put this Territory on a self-supporting basis. The idea of having a territorial fair at regular intervals, as so strongly advocated at the last Civic Convention, is more in the right direction and should receive the unqualified support of all.

Lichen Flora of the Hawaiian Islands

By Vaughan MacCaughey,
Professor of Botany, College of Hawaii.

It is to be greatly regretted that botanical science does not yet possess a monographic account of the Hawaiian lichens. These remarkable plants (composed of algae and fungi living together in composite bodies) are very abundant in all parts and zones of the Islands. They are common in the rain-forests, in the semi-arid sections, in streamways, on the faces of palis, in and near the mouths of lava-tubes and caverns, along the strand, on the arid lava flows and in the excessively boggy summit regions.

On the newer lava fields the lichens form the sole vegetation, and constitute the first invaders. These forms are whitish or grayish in color, and contrast sharply with the glistening black or dull brown of their rocky substratum. In the ascent of Mauna Loa or Mauna Kea one may find every stage of the invasion of lava fields by lichens, mosses, ferns, and seed-plants. On the older flows one frequently finds patches of lichen so abundant as to hide the rock. These lichens are wholly of the crustaceous type, with a growing periphery, and a quiescent or dead central area. Very old lichens may attain diameters of 18-20 inches, but in these cases the central area is dead and usually absent.

A species of Usnea, *U. australis*, is abundant on trees in some of the xerophytic groves that occupy ancient lava beds. *Pelea multiflora*, for example, is often draped with a ragged shroud of this lichen. The bark of certain trees and shrubs, as the citrus group, native hibiscus, mango, etc., seems to be particularly favorable for the growth of lichens. The soap tree, *Sapindus saponaria*, frequently supports a heavy lichen growth. The semi-arid groves along the upper ridges of the Waianae mountains are characterized by heavy growths of usnea and other branching lichens. It should be noted that the lichens do not derive their

nourishment from the live parts of the tree upon which they grow, but merely use the bark as a substratum. They are not parasitic, although commonly so-called; they are epiphytes.

Speaking in general terms, the Hawaiian lichens are unique in being among the first, if not the first, invaders of the lava fields, and in ascending to higher levels on the mountains than any other plants. There are probably about 100 species of lichens, representing many cosmopolitan genera, and indicating their aerial transportation. Like the spores of the true fungi, mosses and ferns, lichen spores may be carried into the upper currents of the air and transported for indefinite distances by this agency.

The Carambola in Hawaii

By Vaughan MacCaughey,
Professor of Botany, College of Hawaii.

The carambola (*Averrhoa carambola* Linn.) is one of the tropical fruits which were introduced into the Hawaiian Islands in very early times, following the discovery of the archipelago by Europeans. It is thoroughly established in many gardens and plantations. The fruit is sold in the Island markets and is utilized in a variety of ways. The carambola is practically unknown in the continental United States, although it is widely planted in tropical regions and grows successfully in southern Florida and southern California.

The genus was named by Linnæus after Averhoës, a celebrated Arabian philosopher (1126-1198 A. D.). Carambola is the East Indian name for the species. The Hindu name is kamrak; the British in India call it the Coromandel gooseberry. It is native to the East Indies, but is now widely cultivated in southern Asia, the West Indies and other tropical countries.

The genus belongs to the family oxalidaceæ, which is represented in the mainland United States only by the little herbs of oxalis and related genera. The family is wholly absent from the indigenous Hawaiian flora, and is represented only by introduced species. The averrhoas comprise two or three arborescent species, extensively planted throughout the tropics. They are commonly referred to by botanical writers as natives of the East Indies, but there seems to be a question as to whether all the species are not really tropical American in origin, and carried to the East Indies and India by the early Portuguese and Spanish traders. There is considerable evidence to support the latter viewpoint, although the question is still unsettled.

The carambola tree is evergreen, 15-30 feet in height, with a dense canopy of dark-green foliage. Trees in Honolulu gardens, because of the relative dryness of the air, are often small and

shrubby, but under more favorable conditions and a humid atmosphere the tree rises to 30 feet or more. The trunk is slender, with many branches. The wood is light red, hard, close-grained, and weighs about 40 pounds per cubic foot. This ranks it as a heavy wood, although not as heavy as many other tropical hardwoods (ex., teak, 50 pounds; greenheart, 72, and jarrah, 65). In India the wood is used for building and furniture; in the Hawaiian Islands the tree is not sufficiently abundant to render its wood of value. It is raised here exclusively for fruit and ornament.

The leaves are alternate, odd pinnate, without stipules, and with 5-10 alternate leaflets. The leaflets are ovate-acuminate, entire, and petiolate. Like other members of this family, they possess sensitive pulvini and exhibit nyctotropic movements.

The flowers are in axillary or lateral cymes, which are often panicle-like. They appear in the naked portions of the branches, and sometimes on the old wood. The flowers are minute, fragrant, and pale-pink to deep purple red in color. The calyx is red, glabrous. The corolla is campanulate, with five petals. There are ten stamens; the five outer are usually minute and sterile. Each locule of the 5-loculed ovary contains numerous ovules.

In the Hawaiian Islands the carambola trees flower in July and August, and fruit from November to January. In India it flowers from February to August. It fruits in three to four years from seed (by which it is easily propagated) and in Hawaii bears one crop annually. In some more tropical regions it bears two-three crops annually.

The fruit is ovate, 2-5 inches long, fleshy, indeniscent, and with five prominent, acutely-angled ribs. The skin is very thin, light yellow and fragrant. It is easily broken or rubbed, discolors badly, and thus makes the fruit a poor shipper. The immature flesh is fibrous and highly astringent; upon complete maturity it becomes watery and crisp. There are two varieties of fruit—the sweet, which is eaten out of hand; and the sour, which is very acid, and is used for pickles. In India the astringent unripe fruits are used as a mordant for dyeing. In Hawaii the acid juice is used to remove rust spots, etc., from clothing. An excellent drink, which might well be called carambolade, is made from the mature fruits, in much the same manner as lemonade is prepared. Its antiscorbutic properties are widely known. In 1914 the Hawaii Agricultural Experiment Station conducted a careful analysis of the carambola fruit and the results were tabulated in part as follows:

	Sweet Variety	Sour Variety
Edible portion	100%	100%
Waste	none	none
Total solids	8.22	8.69
Insoluble solids	3.13	2.84
Ash	.421	.408
Acids as H_2SO_4	.784	.309
Protein	.719	...
Reducing sugars	3.40	5.25
Sucrose	none	.16
Total sugar	3.40	5.41
Fat	.755	.314
Fiber	1.237	.992

The seeds are minute, flat and brown. The funicle is dilated into a fleshy, bilabiate, irregularly cut aril. The embryo is straight, with thin foliaceous cotyledons in a fleshy albumen.

In the Hawaiian Islands the carambola is most abundant in the Honolulu region and in certain parts of the long-settled districts of Lihue and Waimea, Kauai; Wailuku and Makawao, Maui; Kohala and Hilo, Hawaii. It grows well at the lower elevations, 100-2000 feet above sea level. Within its tropical temperature requirements, moisture is a more important control factor than elevation.

Averrhoa bilimbi Linn., the South American cucumber tree, is native to and extensively cultivated in South America, but has not been introduced into Hawaii. It was introduced into India by the Portuguese at a very early date, and has become thoroughly naturalized there. It is a large tree, 20-60 feet high, with smooth, green, cucumber-shaped fruits. These are commonly pickled or candied. The flowers are made into preserves. It is to be hoped that in time both the carambola and the bilimbi will become much more widely known in Hawaii and on the mainland.

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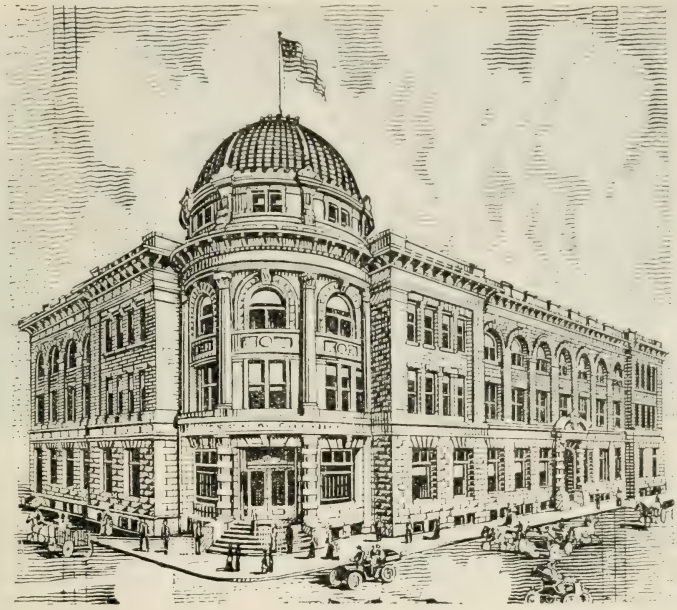
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THE HAWAIIAN FORESTER AND AGRICULTURIST

NOVEMBER, 1917

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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale, the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, NOVEMBER, 1917. NO. 11

This issue contains a valuable contribution from Mr. J. F. Rock, the Consulting Botanist of the Board, on the subject of different species of trees which are best adapted for planting in different regions in these islands for different purposes. This paper is a part of the fulfillment of the working plan on this subject which was printed in the November, 1916, issue of the *Forester,* (pp. 416-418, Vol. XIII), and the subject headings follow the outline in the working plan. It may be stated that a large number of the trees recommended by Mr. Rock have been tried here with success both in former years and very recently by the Division of Forestry and efforts are being made to try out the additional species which are new to the Territory.

On the By Authority page of this issue is printed Rule XIII of the Division of Animal Industry concerning the keeping and breeding of rabbits in the Territory. This rule, which was passed by the Board and approved by the Governor on October 30, 1917, puts into effect the provisions, concerning the keeping and breeding of rabbits or hares, which were authorized by Act 50 of the Session Laws of Hawaii of 1917. The purpose of the act and Rule XIII is to regulate the keeping of these animals in a confined state so that they will not escape and become a possible menace to agricultural interests in the Territory. All keepers of rabbits or hares who have not already done so should apply at once for a permit on a form which will be furnished by the Territorial Veterinarian, Box 207, Honolulu.

Progress is being made in the testing of dairy cattle affected with bovine tuberculosis under the provisions of Act 121 of the Session Laws of Hawaii of 1917, as shown in the October report of the Assistant Territorial Veterinarian. This act carries an appropriation for the indemnification of owners of condemned cattle and it is a pleasure to report that owners of such cattle are coöperating with the Division of Animal Industry in a splendid manner in the efforts to eradicate this disease and establish a safe milk supply for the Territory.

The successful results obtained from the planting of the California timber pine trees, such as Jeffrey pine and Coulter pine, in the experimental plot on the higher slopes of Haleakala, as

reported in this issue, are encouraging and show the possibility of what may be done in the way of growing trees for the production of construction timber.

The tree planting of the Division of Forestry continues to be centered on water producing areas and during October over 1000 koa trees were planted on a part of the Honolulu Watershed forest reserve.

The rules and regulations of the Territorial Marketing Division governing the conduct of the business of this Division, which were approved by the Board on October 29, 1917, are printed on the By Authority page of this issue and the attention of customers is invited to them.

A profit is reported by the Acting Superintendent in all departments of the Territorial Marketing Division for the month of October. This is encouraging and it is hoped that continued improvement will be shown in this new Division of the Board.

Division of Forestry

Honolulu, November 13, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of October, 1917:

MAUI TRIP.

From October 5 to 10, I was on the Island of Maui investigating several forest matters. Forest Ranger James Lindsay accompanied me. The proposed addition to the Makawao forest reserve, consisting of a remnant of government forest land of 263 acres between the present reserve, private land, and the new Haleakala homestead tract, which will soon be recommended for setting apart, was thoroughly gone over and the locations, along the boundary where stretches of fence will be necessary, were determined.

The Kula forest reserve was visited and the question of ridding the land of wild cattle investigated. This is a matter which must be accomplished before tree planting can be undertaken on the reserve and it has already been referred to you in a special report.

It was a matter of great interest to notice the extensive, natural spread of the black wattle tree in the Kula district at the general elevation of 3000 feet above sea level.

A visit was also made to three of the experimental tree plots

on the slopes of Haleakala between the elevations of 6700 and 8300 feet, on which my predecessor planted various temperate zone trees with funds contributed by the U. S. Forest Service, seven and eight years ago. As will be seen in the special report, herewith attached, certain timber pine trees of California have done very well on one of the plots and may be considered as suitable trees for planting at this elevation.

FOREST PLANTING.

In addition to the cleaning around planted trees on the Honolulu watershed in Manoa and Makiki valleys and preparing the ground for additional planting, there were planted out in open government land in Manoa during the month 1013 koa trees and 44 Japanese cedar or a total of 1057 trees.

On the Kealia reserve on Kauai, Ranger Lovell planted out 325 Japanese cedar and swamp mahogany trees and a consignment of 1650 trees was sent to him for additional planting.

Approximately one pound of the Chir pine, *Pinus longifolia*, a commercial timber tree, was received from India by Consulting Botanist J. F. Rock and turned over to this Division. Some of these were personally planted out in seed pots on the experimental tree plots on Haleakala while on my recent trip to Maui, and the balance turned over to parties on Maui for planting in favorable localities at the higher elevations.

The general working plan for reforesting areas for the conservation of water was completed, after it had been gone over by Commissioner Giffard, was accepted by the Board, transmitted to the H. S. P. A. and has since been published as an appendix to the report of the Committee on Forestry of this Association for the year ended September 30.

Preparations for the distribution of trees for planting on Arbor Day, which will be celebrated this year on November 16, have been made by the Forest Nurseryman who has on hand a sufficient supply of shade, forest and ornamental trees for this purpose.

PROTECTION OF BIRDS.

Eight wooden signs embodying the essence of Rule IV of this Division pertaining to the protection of birds have been made and, on October 25, one of these was posted near the landing on the Island of Popoia, opposite Kawailoa, Oahu. On account of the high sea it was not found possible to take additional signs that day to Mokulua, two other nearby islands also included in this rule.

KAHOOLAWE.

In accordance with the instructions received at the Board meeting on October 29, a permit, good for 90 days, was issued the same day to Mr. J. C. Crane to remove the goats from the Island of Kahoolawe. I have since heard from him that he would be

ready to start in on this work just as soon as his sampan is repaired.

MISCELLANEOUS.

At the request of the President of the Board of Health, Consulting Botanist J. F. Rock has kindly consented to coöperate in the compilation of a list of herbs and plants having medicinal properties in order to assist in carrying out the purpose of Act 195 of the last legislature which calls for a report on this subject.

The Maole conduit in Nuuanu valley was inspected and a few of the felled trees along the ditch were found to be in need of lopping in order to reduce their unsightly appearance and the fire danger. The matter was called to the attention of the Land Commissioner who issued the license and he has requested the licensees to attend to the matter.

One day was spent in the Waianae region with a holder of a license from the Land Office to gather algaroba beans, in order to advise on methods of thinning out the thick trees so as to increase the yield of pods and facilitate gathering them.

Another day was spent on Tantalus with a government surveyor investigating proposed exchanges of land requested by the Land Commissioner which will soon be presented for approval.

KAUAI TRIP.

On October 30 I sailed for Kauai and the last day of the month was spent with the Surveyor of the Territory in going over the proposed camping sites in the Na Pali-Kona forest reserve back of Waimea canyon and determining methods for describing camp site areas in permits.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT ON THE EXPERIMENTAL TREE PLANTINGS ON THE SLOPES OF HALEAKALA, MAUI, TERRITORY OF HAWAII, ESTABLISHED BY THE DIVISION OF FORESTRY OF THE BOARD OF AGRICULTURE AND FORESTRY IN COOPERATION WITH THE U. S. FOREST SERVICE.

By C. S. Judd, *Superintendent of Forestry.*

The examination of these trees was made on October 10, 1917, approximately eight years after the first seedlings had been planted out.

Progress reports on the growth of these trees have been made during the past years by my predecessor, Professor Ralph S. Hosmer, who was responsible for the establishment of these ex-

periments. The following report therefore sets forth only the condition of the trees as they are today.

In visiting these plots of trees, which are found on the exposed slopes of Haleakala, Maui, between the elevations of 6700 and 9000 feet above sea level, I was impressed with the unfavorable conditions for tree growth. The soil consists of freshly decomposed volcanic rock, is thin, and is subject to a great deal of wash from the mountain during stormy seasons, and the native vegetation found there consists of only stunted trees and shrubs indicating an adverse exposure. The conditions, therefore, present a severe test of the possibility of growing temperate zone trees at this situation and it is to be wondered that the results have been as good as they are.

The following tables show the success that has resulted from the planting of these introduced trees:

Plot I. Elevation 6700 feet. East side of Puu Nianiau.

Name of Tree	*Planted*	*No. Alive*	*Max. Size Diam.*	*Ht.*	*Condition*
Jeffrey pine, *Pinus jeffreyi*.	1909	17	3½″	11′	Excellent
Coulter pine, *Pinus coulteri*.	1909	38	3″	10′	Excellent
Jack pine, *Pinus divaricata*.	1910	7	2″	9′	Good
Scotch pine, *Pinus sylvestris*	1910	3	2″	7′	Good
Norway spruce, *Picea excelsa*	1910	66	2″	6′	Fair
Incense cedar, *Libocedrus decurrens*	1909	18	1″	6′	Fair
White pine, *Pinus strobus*. .	1910	24	1″	5′	Fair
European larch, *Larix europea*	1910	2	½″	1′	Poor
Red cedar, *Juniperus virginiana*	1910	2	½″	1′	Poor

Plot II. Elevation 6900 feet. Southwest side of Puu Oili.

Jeffrey pine, *Pinus jeffreyi*.	1909	9	2″	7′	Good
White pine, *Pinus strobus*. .	1910	4	1″	3′	Fair

Plot III. Elevation 8300 feet. ¾ mile above Plot II.

Jack pine, *Pinus divaricata*.	1910	1	½″	4′	Poor
Norway spruce, *Picea excelsa*	1910	1	½″	2′	Poor
White pine, *Pinus strobus*. .	1910	4	½″	2′	Poor

Plot IV. Elevation 9000 feet. ¾ mile North of Kilohana.

This plot was not visited since the local ranchman told me that none of the trees planted on it were alive.

In analyzing the above results it should be borne in mind that Plot I possesses conditions more favorable for tree growth on account of better soil and more moisture. It is not surprising, therefore, that the best results are found on this plot. The other

plots receive less rainfall and the comparative failure of the trees on these other plots is probably due chiefly to this cause.

It will readily be seen that species of the true pine family have done the best and may be considered as a success in the planting at this elevation. Foremost among these stand out the two timber pines of California, the Jeffrey pine and the Coulter pine, and their growth here of 10 to 11 feet in height in eight years stands up rather well in comparison with growth in their native habitat. The Jack pine of Northeastern America and the Scotch pine and Norway spruce from Europe come next in successful growth and it would be safe to plant any of these five in the same region on an extensive scale. The other species should be experimented with further before being planted out extensively. It is interesting to note that on one of the Scotch pine trees, only seven years old, cones had begun to form.

Several different species of eucalyptus and trees of the silk oak, *Grevillea robusta*, were found on all three plots, but none of them was especially flourishing with the exception of the blue gum, *E. globulus*, and silk oak, specimen trees of which were found to be, respectively, 12 and eight feet high.

The seed spots established more recently with few exceptions do not show up at all well.

To further the experiments, seed spots of the Chir pine of India, *Pinus longifolia*, were sown in Plots I to III at the time of this examination.

FOREST NURSERYMAN'S REPORT.

Honolulu, November 12, 1917.

Superintendent of Forestry, Honolulu, T. H.

DEAR SIR:—I herewith submit a report of the principal work done during the month of October:

NURSERY.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold			193	193
Gratis	3500	950	527	4977
	3500	950	720	5170

COLLECTIONS.

Collections on account of plants sold amounted to	$ 2.75
Rent of office building, Nursery grounds, for August	35.00
Total	$37.75

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants under this heading amounted to 1000 in transplant boxes.

We have on file orders for 70,000 seedlings to be delivered within the next months.

MAKIKI STATION.

The sawmill is now in proper working order. We have cut up a number of fence posts, also some sample specimens of timber trees to be found growing on the Islands. Other work done at the station has been principally routine.

HONOLULU WATERSHED PLANTING.

The men have been kept busy during the month hoeing and clearing away grass and weeds from the trees lately planted. We are making preparation for more planting to be done in Makiki main valley.

ADVICE AND ASSISTANCE.

The writer has been called upon to give advice and make calls as follows: Calls made, 6; advice by telephone, 12; advice by letter, 6; advice given people calling at Nursery, 8.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

Division of Entomology

Honolulu, November 12, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—During the month of October the insectary handled 27,400 pupae of the melon fly, from which there were bred 634 females and 573 males, *Opius fletcheri.*

The distribution of parasites was as follows:

Opius fletcheri.

Oahu:	Females.	Males.
Moanalua	470	400
Moiliili	185	175

Diachasma fullawayi.

Oahu:		
Kalihi	50	20
Nuuanu	10	10

Diachasma tryoni.

Oahu:		
Kalihi	30	40
Nuuanu	50	60
Hawaii:		
Kohala	100	60

Tetrastichus.

Oahu:		
Kalihi	200	...

Chalcid.

Oahu:		
Moanalua	200	...

Paranagrus (Corn leaf hopper parasite).

Oahu:		
Makiki Nursery	2650	...

Very respectfully,

D. T. Fullaway,
Entomologist.

Division of Plant Inspection

Honolulu, October 31, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of October, 1917, as follows:

During the month there arrived at the port of Honolulu 37 vessels of which 17 carried vegetable matter consisting of the following:

Disposal.	*Lots.*	*Parcels.*
Passed as free from pests	1071	33,304
Fumigated	2	27
Burned	24	24
Returned	3	3
Total inspected	1100	33,358

Of these shipments 33,118 packages came as freight, 127 packages as baggage of passengers and immigrants and 113 packages as mail matter.

RICE AND BEAN SHIPMENTS.

During the month 3369 bags of rice and 337 bags of beans

arrived from Japan and Oriental ports and after careful inspection were found free from pests.

PESTS INTERCEPTED.

Approximately 3293 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and from the same were seized and destroyed by burning eight packages of fruit and 14 packages of vegetables.

On October 12, two packages of palm seeds from Singapore came by mail for Mr. J. F. Rock. These were fumigated with carbon bisulphide as a precaution. Also a package of Japanese poha (*Physalis alkekengi*) in the mail from Japan. This was returned as unmailable.

On October 16, one box of pears from California by Wells Fargo and Company's Express was destroyed as the fruit was badly infested with codling moth.

On October 23, 25 coconuts arrived in the Luka from Fanning Island and these were fumigated before delivery as they were infested with scale (*Aspiodiotus destructor*).

On October 24, one package of tree seeds and a package of plum pits from Japan in the mail were returned as unmailable; and one package of corn from Japan found in the baggage at the Immigration Station was seized and burned.

On October 12, Mr. F. X. Williams returned from Manila and brought with him several packages of beneficial insects for the Planters' Station. The usual precautions were taken with the soil and packing material.

HILO INSPECTION.

Brother M. Newell reports the arrival of seven steamers and two sailing vessels. Four steamers carried vegetable matter, the sailing vessels lumber. Three thousand two hundred forty-six packages of fruits and vegetables were inspected and found free from pests. During the month the S. S. Anyo Maru arrived direct from Japan and brought 3735 bags of rice, 301 bags of beans, two bags of peas and six packages of vegetable seeds, a total of 48 lots, which were passed as free from pests.

KAHULUI INSPECTION.

Mr. Edwin C. Moore, Fruit and Plant Inspector for Maui, reports the arrival of seven vessels at the Port of Kahului. Two steamers carried vegetable matter consisting of 11 lots and 719 packages. One crate of white turnips was found infested with the radish maggot and was dumped at sea; the rest of the shipments were passed as free from pests.

INTER-ISLAND INSPECTION.

Sixty steamers plying between Honolulu and other island ports were attended to and the following shipments were passed as free from pests.

Taro	543	bags.
Vegetables	352	packages.
Plants	207	"
Fruits	23	"
Total inspected	1116	packages.

Seven packages of plants and three packages of fruit were seized and refused shipment on account of infestation and undesirable soil.

Respectfully submitted,

E. M. EHRHORN,
Chief, Division of Plant Inspection.

Division of Animal Industry

Honolulu, November 9, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—I have the honor to submit herewith my report on the work of the Division for the month of October:

TUBERCULOSIS CONTROL.

	Tested.	*Passed.*	*Condemned.*
C. H. Bellina	230	173	57
C. H. Bellina	72	58	14
C. H. Bellina	19	10	9
C. M. Cooke	9	9	0
L. Hoon Chan	2	2	0
L. Hoon Chan	1	1	0
Waimanalo Plantation	133	132	1
K. Helau	8	8	0
Waialae Dairy	479	372	107

The above list shows a total of 953 head tested out of which number 765 were passed and tagged and 188 condemned and branded.

Of the above condemned animals 187 have been appraised and slaughtered under the provisions of Act 121 of the 1917 Session Laws which provides for the compensation of owners of condemned tuberculosis animals.

The number of condemned animals was considerably in excess of what was anticipated but considering the high percentage of tuberculosis present from the beginning in the two dairies concerned and that more than a year has passed since the last test, a large number of diseased cattle should have been expected.

The influence of the Compensation Act is already making it-

self felt in that owners are desiring more frequent tests and are more willing to coöperate with the Board in its efforts toward the entire eradication of tuberculosis. The considerable opposition which has been experienced in certain quarters has apparently melted away, as the dairymen are realizing the efforts the Board is making to help them and to establish for this Territory a safe milk supply.

The condemned cattle from the Kuliouou dairy showed a considerable amount of disease on post mortem examination and three carcasses had to be condemned entire as unfit for human consumption.

On the other hand the condemned cattle from the Waialae dairy, though large in number, showed surprisingly little disease and, while all showed the presence of tuberculosis in one or more organs in the body, none had to be condemned.

A few showed open lesions in the lungs and undoubtedly acted as spreaders of the infection. With their elimination from the herd together with the thorough sanitary measures now in force at this particular dairy the time is near at hand when further losses from this disease should cease.

The intrapalpebral tuberculin test, a method originated and practised in this Territory for a number of years, has again demonstrated its efficiency in accurately detecting the tuberculous animal. This together with the helpful influence of the Compensation Act should, in a comparatively short time, eliminate tuberculosis from the herds of this Territory.

ANTHRAX.

This disease has ceased to be an active menace to the live stock industry of this Territory as far as the islands of Oahu and Maui are concerned. All quarantine restrictions have been removed from these two islands and the inter-island shipment of live stock allowed without permit except such as may come from the infected areas on Maui.

As far as this island is concerned, considering the prompt and very effective measures taken in the beginning, I think we can safely say that anthrax has been entirely eradicated. The amount of infection still remaining in the soil on Maui where the disease made its appearance is problematical, but considering its early diagnosis and the fact that serum was at hand for immediate use, the prompt burning of all carcasses and the effective quarantine measures established, it is probably slight and the remaining restrictions now in force can soon be done away with.

At Hanalei, Kauai, we have a much more serious condition. Being the first place in which the disease broke out in this Territory there was no serum and vaccine here with which to combat it. Due to the fact that quite a few animals died before any report was made of it and to the fact that nearly a hundred carcasses were buried before burning operations commenced, the

pasture lands became and are thoroughly saturated with the infection.

Considering the character of the disease and the great resisting powers of the spore form of the infection to all disinfectants and the experiences gained in similar outbreaks in other countries, these lands must be looked upon as remaining dangerous for a considerable period of time.

That there have been no certain deaths from anthrax reported from Kauai since August 24 points to a highly successful vaccination rather than to a decrease of the original infection. These lands still are and can be proved dangerous to the unprotected animal. Consequently no repeal of the quarantine restrictions now in force, and which have proved so successful in keeping the disease from spreading from its original focus, can be advised.

IMPORTATIONS OF LIVE STOCK.

S. S. Lurline, San Francisco: 2 thoroughbred stallions, 3 thoroughbred colts, 11 thoroughbred mares, Geo. W. Berry.

This shipment brought down by Mr. Berry, superintendent of the Nevada stock farm, constituted a notable and very welcome addition to the racing stock of the Islands. Among them is to be found some of the very best racing blood on the mainland. A few more shipments of this kind are needed.

S. S. Matsonia, San Francisco: 2 cts. poultry, W. F. X. Company; 1 dog, A. K. Shephard; 1 dog, Gus Schuman.

S. S. Sierra, Sydney: 1 dog, H. Whitney.

S. S. Wilhelmina, San Francisco: 20 cts. poultry.

S. S. Maui, San Francisco: 3 cts. rabbits, 1 ct. pigeons, Robert Horner; 2 cts. chickens, W. F. X. Company; 1 cat, Dr. Herbert.

S. S. Hyades, San Francisco: 1 standardbred mare, C. Hastings Judd.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Marketing Division

Honolulu, November 17, 1917.

Board of Commissioners, Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I respectfully submit the following report of the Marketing Division for the month of October, 1917.

The consignments to the Division increased a little during the month. There were 165 consignments received. A list showing the different kinds of produce and the quantities received from each island is enclosed herewith.

The consignment sales for the month amounted to $12,128.60. The profit for the consignment department was $578.89. The butcher department made a profit of $18.60 during the month, the first shown since July first. The retail department made a profit of $26.88, making a total profit of $624.37 for the month.

Enclosed herewith is a statement of operations for the month showing the net profit and a copy of the general ledger trial balance.

Respectfully submitted,

O. B. LIGHTFOOT,
Acting Superintendent.

SEGREGATION OF PRODUCE RECEIVED BY THE MARKETING DIVISION DURING THE MONTH OF OCTOBER, 1917.

Articles:	Total	Oahu	Hawaii	Maui	Molokai	Kauai
Avocados	127	..	127	..	..	..
Asparagus, lbs.	137	137	..	..	..	..
Bananas, Chinese, bches.	509	509	..	..	..	..
Bananas, Cooking, bchs.	12	..	12	..	..	..
Beans, dry, 100 lb. sacks.	89	1	..	81	7	..
Beef, dressed, carcasses.	134	3	10	113	8	..
Cabbage, lbs.	60	60	..	..	..	..
Chickens	154	97	39	..	18	..
Corn, cracked, 100 lb. sacks	20	..	..	20	..	..
Corn, dry, 100 lb. sacks.	300	5	160	135	..	..
Cucumbers, dozen	96	96	..	..	..	..
Ducks, each	63	52	11	..	..	..
Eggs, chicken, dozen	181	84	10	..	87	..
Egg plant, dozen	6	6	..	..	..	..
Fresh island butter, lbs.	18	18	..	..	..	..
Hides	6	3	..	..	3	..
Honey, small cakes	6	6	..	..	..	..
Kukui nuts, 100 lb. sacks.	3	3	..	..	..	..
Limes	8952	..	700	442	7810	..

Articles:	Total	Oahu	Hawaii	Maui	Molokai	Kauai
Mutton, carcasses	2	..	..	..	2	..
Ohelo berries, lbs.	300	..	300	..	..	..
Oranges, Hawaiian	2486	2486	..	..	..	..
Papaia, lbs.	32	32	..	..	..	..
Peanuts, large sacks	70	70	..	..	..	..
Peas, dry, 100 lb. sacks	1	..	..	1	..	..
Pigs, live and dressed	18	11	..	..	7	..
Pohas, lbs.	703	..	703	..	..	..
Potatoes, 100 lb. sacks, Irish	6	6	..	..	..	..
Potatoes, 100 lb. sacks, sweets	93	80	..	..	..	13
Potatoes, 100 lb. sacks, red sweets	171	171	..	..	..	..
Rice, 100 lb. sacks	120	120	..	..	..	..
Rabbits	107	107	..	..	..	..
Turkeys	1	1	..	..	..	..
Tomatoes, lbs.	3419	3419	..	..	..	..
Veal, dressed, carcasses	28	10	1	11	6	..

GENERAL LEDGER TRIAL BALANCE, OCTOBER 31, 1917.

Furniture and fixtures	$ 3,224.42	
Automobiles	1,286.50	
Motorcycle	60.00	
Pineapple crates	2,549.80	
Butcher Department	397.83	
Retail Department	157.63	
Seed Account	467.49	
Bank of Hawaii, Ltd	3,638.78	
Petty Cash	250.00	
Accounts Receivable	3,990.95	
Longley and Westgate	3,000.00	
Consignors' Account		$ 1,722.92
Vouchers payable		831.06
Note Bank of Hawaii		1,000.00
Revolving Fund 1915-1917		4,911.64
Reserve for doubtful accounts		2,414.29
Seed Appropriation 190		1,133.45
Appropriation 206A		919.36
" 206B		4,033.49
" 206C		760.00
Revolving Fund 1917-1919		4,171.40
Surplus		807.74
Consignment expense		333.99
Departmental expenses	950.78	
Cost of merchandise	15,635.64	
General expense	5,815.20	

Butcher sales		10,939.17
Retail sales		5,515.91
Hold Account	220.44	
Commissions		2,415.53
Interest Account	47.27	
Not deposited on 10/31/17	217.22	
	$41,909.95	$41,909.95

TREES RECOMMENDED FOR PLANTING.

By Joseph F. Rock, *Consulting Botanist.*

Introduction.

The Hawaiian forest must be divided into various zones which, it may be stated in the beginning, are absolutely dependent upon one another for their existence; for example, a middle forest zone depends for its existence on the zone immediately below it as well as on the forest belt above it, no matter of what nature the particular forest may be. If the middle forest zone adjoins a bog region, as is the case on West Maui, Kohala, Hawaii, and Waialeale, it is absolutely essential that such be kept intact; they must not be drained by artificial means, especially not by the method known as Louisiana drain, which method has actually been tried by a particular plantation on the Island of Maui. The disturbing of such a bog region as mentioned, is for obvious reasons absolutely detrimental to the immediate forest below. First the bog vegetation will naturally die out and thus the actual means of water retention will disappear. In time the summit of such a mountain harboring a bog will become bare and erosion will encroach upon the forest below, (as is the case along Hanokawai Gulch on Maui), and eventually destroy the middle forest below, which is so essential for water conservation.

Grazing in the middle forest zone should be absolutely prohibited wherever it is necessary to conserve the forest. Even if no actual damage is done by animals browsing on the trees and undergrowth, harm is done by their tramping over the surface roots of our shallow-rooted trees which destroys the bark and allows rot to set in, which gradually finds its way into the trunk and causes the tree to die.

The lower forest is also essential to the existence of the main watershed. It acts as a barrier against the encroachment of undesirable vegetation such as weeds and grasses, guavas, etc. Care should be exercised to keep this lower forest zone also free from cattle and prevent the spread of honohono (*Commelina nudiflora*) which is death to even such trees as the *Kukui* and *Ohia ai,* as can be seen in the lower forest of Manoa, especially in the narrow valleys now filled with dead trees. To think that one can

clear one zone without interfering and injuring the adjacent zone is certainly a mistaken idea.

It may not be out of place to point to the promiscuous cutting of trails, especially in the mountains of Oahu where the mountains are more or less precipitous. The trails are extremely detrimental to the forest. Landslides will always follow such a practice and the surfaces of such landslides are taken up by such pests as the Hilo grass, thus precluding any natural reforestation. The encroachment of Hilo grass into a Hawaiian forest means the death of the latter. The cutting of trails should be done according to the native fashion of following the ridges.

I. THE CONSERVATION OF WATER AND THE PROTECTION OF WATERSHEDS.

The areas of wet forest zone have different contours on the various islands or even on one and the same island. In some places the wet forest covers level tracts of land where there is often bad drainage, especially when the forest had been given over to grazing; the soil in such places is usually very sour and is therefore unable to support a vegetation similar to a well drained area. The Kailua forest on Maui serves as an example of this.

It has been observed that such poorly drained areas usually covered with Hilo grass have lost their native vegetation, (Kohala Awini, Kailua, Maui), save certain species of trees belonging to the *Araliaceae* and *Euphorbiaceae*. This shows that the Hawaiian *Araliaceae* are able to grow not only well but luxuriantly in very sour soil. The planting of such *Araliaceae* as various species of *Tetraplasandra* (*Triplasandra*), which grow readily from seed as well as cuttings, should be encouraged. It would be well to introduce other species of *Araliaceae* from the Philippines and China.

I contend that *Brassaia actinophylla*, a tree belonging to the *Araliaceae* and commonly planted in Honolulu, should be planted as a forest tree in the middle forests especially in sour soil. The tree in question is not attacked by insects, it fruits profusely, is easily grown from cuttings and seeds and as it thrives in the cooler regions of Australia, where it is a native, it is well adapted to our temperate elevation.

Of native trees adapted to sour soil, mention must be made of *Antidesma platyphyllum*, the *Haa* or *Hame* of the natives, which has proved able to exist on lands where all other trees had succumbed to bad drainage.

Where good drainage exists nearly all of our native trees of that region will be found quite suitable. *Acacia Koa* will prove one of the most useful trees.

Of foreign trees the following may be enumerated as suitable for planting in the wet forests:

Albizzia moluccana.—This tree, while short lived, is a valuable forest tree, especially in areas with sour soil. It likes heavy volcanic clay and is a rapid grower. Experiments in Java with this

tree have given the following results: Trees 2 years and 9 months old had reached a height of 56 feet; trees 9 years old had a height of 112 feet. It is true the tree does not live longer than 15 to 20 years, but as it volunteers there should always be a good stand. *Albizzia moluccana* is especially valuable as a soil improver. It develops an enormous root system which, when the tree dies, leaves huge channels which act as drainage; besides, the enormous amount of organic matter which such a tree furnishes during its life time can only be of benefit to a sour and clayey soil.

Ficus spp. The genus *Ficus* consists of over 600 species, a large portion of which grows in the Malayan Archipelago, India, and tropical Asia in general. The planting of species of *Ficus* such as the various Banyans *F. bengalensis, F. religiosa, F. benjamina* and hosts of others as forest trees in the wet forest regions cannot be too highly recommended. The writer has observed these various Banyans at elevations from practically sea-level to 4000-5000 feet in the Himalayas.

Seeds of *Ficus* can be obtained easily from the Botanical Gardens of India, and as an ounce of seed produces usually several thousand trees, the propagation of the same would be a comparatively easy matter. It is true that certain insects will be necessary for the fertilizing of the fruits of such *Fici* when once established in the forest. Mr. Muir informs me that the introduction of such insects (usually wasps) is a comparatively easy matter.

Even if no insects for the fertilizing of such Banyan fruits can be secured the trees in question will prove to be extremely valuable, first on account of their longevity. Banyan a thousand years old are no rarity in India. Trees with several hundred trunks covering an area of more than an acre are quite common. Consequently the planting of various species of *Ficus* which produce dense shade and a solid forest cover cannot be too highly recommended.

Other trees to be planted are:

Samanea saman, the Monkeypod.

Toona febrifuga, a Cedar tree already growing in the Territory. It is a quick grower.

Toona calantas, a native of the Philippines. Living plants were introduced by myself from the Philippines. They are rapid growers.

Cedrela australis, a relative of the above mentioned species of Toona, is also a rapid grower and well worth planting.

Pterocarpus indicus, the Narra. There are several specimens of this tree in the Territory. Hardwood cuttings of this tree are the most successful means of propagation. They root very readily and make rapid growth. The tree is adapted for open land especially below the wet forest lands at elevations of 1000 feet and somewhat higher.

The following trees may be recommended for planting in the wet forest zone:

Ficus infectoria, seeds or cuttings;

Ficus bengalensis, seeds or cuttings;

Ficus benjamina, seeds or cuttings;

Ficus indica, seeds or cuttings;

Ficus Roxburghii, seeds or cuttings;

Ficus religiosa, seeds or cuttings;

Ficus hispida, seeds (obtainable in quantities from Hongkong, a rapid grower—for undergrowth).

Ficus cunninghamii, known as the Java willow, a very large spreading tree with feathery branches and small leaves.

Ficus elastica, Ficus macrophylla, Ficus regia, seeds of these may be obtained from any Botanic Garden in Ceylon or India.

At four thousand to six to seven thousand feet *Erythrina arborescens,* a common tree at Darjeeling, should be planted. It is able even to stand heavy snowfall and is a quick growing tree.

For up country or in wet forests may also be planted:

Dalbergia sisso and *Albizzia Lebbek,* both of which grow at altitudes up to 5000 and 6000 feet. In the Himalayas I have observed both of them at 5000 feet and higher. They do as well in wet as in dry regions.

Eugenia aquea, up to 5000 feet, (seeding trees in Honolulu).

Eugenia sandwicensis (*Ohia ha*), grows easily from seed, the best seed being obtainable from Maui and Oahu.

Parkia timoriana, Parkia Roxburghii, Parkia Africana, Parkia biglandulosa, all splendid tall, quickly growing trees of the lower forest zone; seedlings growing at the College of Hawaii.

Immediately below the wet forest *Kukui* plantings may be encouraged with *Erythrina* trees, such as *Erythrina lithosperma* and *Erythrina umbrosa,* both quick and tall growing trees; they will thrive up to an elevation of 100-3000 feet.

Low-lands: Various species of *Terminalia* as *Terminalia sumatrana, Terminalia belerica, T. chebulia,* seeds easily obtainable from India or Java, belong to the species already established here.

Pelthphorum inerme, up to 1500 feet, drier regions.

Schizolobium excelsum, a large, quick growing tree up to 1500 feet.

Spathodea campanulata, African Tulip tree, thrives up to 1500 feet.

Ailanthus excelsa, large, quick-growing tree.

Artocarpus integrifolia (from seed).

For higher levels, up to 4000 feet; *Acacia melanoxylon; Calophyllum Walkeri,* (seeds obtainable from Ceylon); various *Eucalyptus,* especially *Eucalyptus alba,* in rain forests. *Pinus longifolia,* of which seeds are on hand, may well be considered as a timber tree for the higher elevations up to snow. (For information on the species in question see Indian Forest Memoirs, Vol. I, *Pinus longifolia,* A Sylvicultural Study, by R. S. Troup, 1916.)

II. THE PREVENTION OF SAND OR DUST DRIFTING.

As far as the checking of drift sand is concerned there may be recommended the following native plants:

Sesbania tomentosa, a leguminous plant, prostrate and creeping over large surfaces of sand which grows well at the beach or on dunes farther inland.

Heliotropum anomalum.

Argyraea tiliaefolium (Pilikai), a stout and strong climber and runner belonging to the Convolvulus Family.

Zoia pungens, a species of grass already plentiful; very useful in checking sand drift.

Scaevola frutescens (Naupaka Kahakai).

Of foreign plants the following will be found suitable to prevent sand drifting:

Mesembrianthem spectablile, Mesembrianthem aequilaterale, Mesembrianthem litorale (Ice plant). The latter two are employed extensively against sand drift and for the reclaiming of land in Southern California. It grows easily from portions of plants which can be secured readily.

It is a difficult matter to recommend trees for the stopping of sand drifts. In my opinion it is necessary first to check the drift by low-growing plants such as have been recommended.

The planting of species of *Agave* and *Fourcroya* will be found useful; also *Sanseviera* and various succulent *Euphorbia* as *E. catimando.*

Of trees, mention may be made of *Prosopis velutina, Zizyphus jujuba, Erythrina spp.*

Especially recommended is *Leptospermum laevigatum.* It is extremely useful in arresting drift sand either at sea shores or in sand deserts, and is also a splendid hedge plant. It is a native of Australia, though seeds can be obtained from Southern California.

Calophyllum inophyllum, the native *Kamani,* is a tree which should be planted in groves along beaches and inland where there is likely to be danger of sand drift.

Terminalia catappa may also be used.

Melaleuca parviflora, useful as a sand stay.

Myoporum humile is equally useful.

III. THE REFORESTATION OF ERODED AND ARID AREAS ON SLOPES OF MOUNTAIN RANGES AND ON PLAINS.

Of certain native trees to be recommended for planting in the dry or arid regions of these islands, it may be stated that nearly all of them are extremely slow growers.

Those recommended for planting are:

Sapindus oahuensis (volunteers freely);

Sapindus saponaria;

Acacia Koaia. The *Koaia* of the natives, of which seeds can be obtained from trees above *Kawaihaeuka* where it is plentiful.

Osmanthus sandwicensis, the *Pua* or *Olopua,* a very common tree species of *Sideroxylon.*

Sophora chrysophylla, the *Mamani,* will grow well in those regions. It is common on the lava flows at low elevations, also in dry gulches on Lanai.

Myoporum sandwicense, the *Naio.*

Erythrina monosperma, the *Wiliwili.*

Of foreign trees, the following may be recommended:

Erythrina indica, Erythrina umbrosa, Erythrina arborescens, Erythrina caffra, Erythrina fusca, Erythrina tomentosa, Erythrina corallodendron, Erythrina ovalifolia.

Azadirachta indica, the Nim or Neem tree of India; a very important tree in India and one of the widest spread trees in that country, especially through the arid regions.

Melia azedarach, already naturalized on Kauai. It is not such a useful tree as the former; it is spread easily by birds and when growing in groves is not to be despised.

Alectryon excelsum, a native of New Zealand and a relative of the Hawaiian *Alectryon macrococcus,* which grows in the lower Waianaes. The former is a handsome tree and well established in Southern California where seeds can be obtained. Seedlings in the College of Hawaii aboretum.

Various species of *Callistemon* or bottle brushes. Seeds from California are growing at the College. Various species of *Melaleuca* may also be grown. *Tristania,* large trees of the dry regions, seeds obtainable in California, seedlings growing at the College of Hawaii.

An effort should be made to introduce various *Acacias* from the arid regions of Africa. *Acacia arabica* is already in Honolulu bearing seeds. *Acacia giraffae* or *A. Seyal.* This species forms woods of enormous extent in the Black Mountains of Africa in dry, stony places.

Acacia arabica deserves special mention and the following may be stated:

The *Gum arabic, Acacia arabica,* should be planted in our arid regions; it prefers a dry soil and it is never leafless. It can be grown as a forest crop in any of the dry regions in the Islands. The wood is excellent as fuel and will well compete with *Kiawe.* It yields a valuble timber while luxuriating in the poorest waste lands. It is an excellent tree for poor soil and exposed situations, and continues to flourish during long periods of drought. It is one of the most useful trees for broad-cast sowing, as the seed germinates readily and is hardy and independent of rain. It can be planted as a thick belt along roads to form a roadside avenue, which would produce a vast amount of fodder. The seeds embedded in a nutritious pod would be spread by cattle quite as easily as the algaroba or kiawe. It is of rapid growth and as it requires no water and improves sterile tracts of land, it should by all means be given a fair trial. The tree will live up to a hundred years or even more. There is one tree of this species in

Honolulu. It was introduced by Dr. Hillebrand in whose former grounds it is still in existence though crowded out by large trees which prevent it from receiving the necessary sunlight. It flowers and fruits profusely. Seedlings could be started from the seeds of this lone tree. Or still better, seed could be imported from India in large quantities and sown broadcast in lee side valleys of the Waianae Mountains and elsewhere. The bark may be made use of as it contains a large amount of tannin. A tree 8-10 years old will yield half a ton of bark.

Acacia catechu, already growing in the Territory.

Species of *Pithecolobium* from Mexico.

Species of *Prosopis* other than *P. juliflora.*

Schotia latifolia, Schotia brachypetala, specimens growing at College of Hawaii from seeds, the latter obtainable from South California. Leguminous trees with handsome red flowers from the dry regions of South Africa.

This list can be greatly extended but the above will furnish a good working basis. The Consulting Botanist will at all times be ready to help and furnish advice as he is in communication with various botanists over the world, many of whom he knows personally. He is ready to offer his services in securing these seeds.

In conclusion he wishes to emphasize the value of certain species of genus *Ficus* for reforestation of the wet regions.

BY AUTHORITY.

TERRITORY OF HAWAII.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

RULE XIII.

DIVISION OF ANIMAL INDUSTRY.

Rule and Regulation of the Board of Commissioners of Agriculture and Forestry concerning the Keeping and Breeding of Rabbits.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation pertaining to the keeping and breeding of rabbits in the Territory of Hawaii in accordance with Act 50 of the Session Laws of Hawaii of 1917.

Section 1. Every keeper or breeder of rabbits or hares, whether the same are kept singly, as pets or in numbers for their meat, skins, or other purposes, must obtain from the Board of Agriculture and Forestry a permit to keep or breed rabbits.

Section 2. In order to obtain such permit it is necessary for the applicant to submit to the Board of Agriculture and Forestry an affirmed statement to the effect that he will use due diligence and take every possible precaution to the end that such rabbits, for whatsoever purpose kept, remain confined.

Section 3. Applicants for permits must obtain from the said Board or its local representative an application blank to be filled in and returned.

This rule shall take effect upon its approval by the Governor of Hawaii.

Approved this 30th day of October, 1917.

LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii.

RULES AND REGULATIONS OF THE TERRITORIAL MARKETING DIVISION.

Board of Commissioners of Agriculture and Forestry. Territory of Hawaii.

SHIPPING MARK:

All consignments of goods for the Division must be marked "T. M. D." The name and post office address of the consignor must be on each package in order to prevent confusion.

POST OFFICE ADDRESS:

Address all mail to the Territorial Marketing Division, P. O. Box 1237, Honolulu, T. H.

BILLS OF LADING:

Where goods are shipped by rail or steamer, a copy of the Bill of Lading must be mailed to the Division at the time of shipment or earlier if possible.

FREIGHT:

The freight on consignments may be charged to the account of the Division. In such cases the amount will be deducted on the account sales.

COMMISSION:

A five per cent commission will be charged on the gross sales on all consignments and deducted on the account sales.

DRAYAGE:

A drayage charge of one cent a cubic foot measurement or fifty pounds weight will be charged on all shipments hauled from the wharves or railroad depot, with a minimum charge of five cents. Hauling goods for producers in the city, to the Division, will be at the regular rates charged by the draying companies.

COLD STORAGE:

One-quarter of a cent a pound per month or fraction thereof will be charged for cold storage on all dressed meats.

LIVE STOCK:

Unless live stock can be sold immediately at a fair price, it will be slaughtered and put in cold storage, the slaughtering and cold storage charges being deducted on the account sales.

FEED:

A charge of one cent a day will be made for each head of poultry held on consignment at the Division.

CANDLING:

A charge of one cent a dozen will be made for candling each dozen unstamped eggs received. Eggs stamped with the name and guarantee of the producers will not be charged for candling.

GRADING:

A charge will be made for actual expenses for grading and packing consignments received in poor condition.

SETTLEMENTS WITH CONSIGNORS:

Account sales will be rendered as soon as the consignment is disposed of and settlement will be made in full at the same time if funds are

available. In no case will settlement be made later than the 10th of the month following date of sale.

CREDIT ACCOUNTS:

No consignor will be allowed to purchase merchandise against his consignment account unless he has a credit cash balance due him on the books of the Division, or a consignment of non-perishable produce, which when sold will more than pay for any goods purchased. No credit accounts will be opened on the books for retail customers. Persons ordering seed by mail must enclose check or post office money order to cover cost before seed will be sent.

Only business houses of good financial standing and government institutions will be given credit, and these will be required to settle in full within thirty days from date of rendering account.

All buyers and sellers shall conform to these rules and regulations in order to claim any right under Act 206 of the Session Laws of 1917, Territory of Hawaii.

Approved October 29, 1917.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

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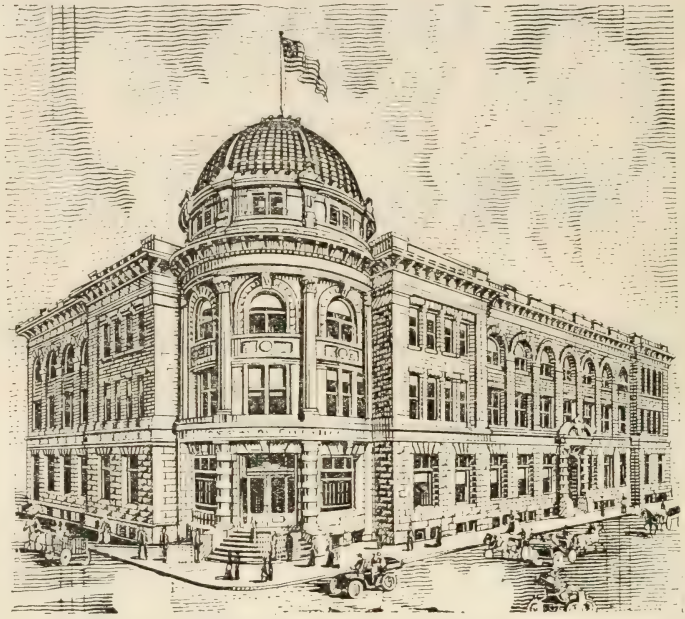
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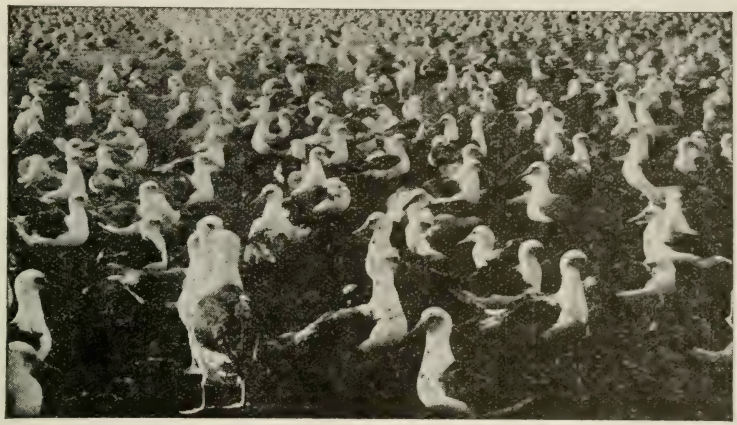
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THE HAWAIIAN FORESTER AND AGRICULTURIST

DECEMBER, 1917

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Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale, the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter, always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

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The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIV. HONOLULU, DECEMBER, 1917. NO. 12

Although the number of trees distributed from the government nurseries for planting out on Arbor Day, which this year was celebrated on November 16, fell somewhat below the average and amounted to a total of only 12,111 trees, general interest in tree planting is still great as indicated by the fact that the Government Nursery has at present on file orders for 265,000 seedlings to be delivered within the next two months. Those who have chiefly celebrated Arbor Day in the past, viz., school children, residents of army posts, and homesteaders, have already planted up on past Arbor Days most of the available areas at their disposal and so the demand for trees for planting on Arbor Day will probably not increase in the future.

The new buildings for the Division of Plant Inspection on Kekuanaoa street are almost completed and Chief Plant Inspector Ehrhorn expects to move into the new quarters with his staff before the end of the year. They are of reinforced concrete, fireproof, and built according to modern ideas so as to facilitate the important work of plant inspection and fumigation to prevent injurious insects from gaining a foothold here.

Entomologist Fullaway continues to breed out, in addition to the parasites on the fruit fly, large quantities of the corn leaf hopper parasite, sending out for liberation in cornfields on Oahu and Maui a total of 13,500 during November. This parasite is already reported as doing very efficient work.

The testing of dairy animals for bovine tuberculosis by the Territorial Veterinarian and his assistants continues in the effort to reduce greatly if not entirely eliminate this obnoxious disease. Of the 178 animals tested during November all but 6 per cent were passed as free from the disease.

On account of ill health Deputy Territorial Veterinarian H. B. Elliot has been granted leave without pay for one year beginning December 1. Dr. O. B. Shipman will serve as his substitute on Hawaii during his absence.

Lieut. A. T. Longley, on receiving his commission with the U. S. Army, has been granted a leave of absence from the position of Superintendent of the Marketing Division for the duration of the war.

Division of Forestry

Board of Commissioners of Agriculture and Forestry.

Honolulu, December 12, 1917.

GENTLEMEN:—I respectfully submit the following routine report of the Division of Forestry for the month of November, 1917:

KAUAI TRIP.

During the first three days of the month I was still on Kauai investigating several forest matters. In company with Forest Ranger Hosea K. Lovell I went over a large part of his district inspecting his work and instructing him in his future duties. The trees which he has been planting on the Kamalomalo flats on government land within the Kealia forest reserve are doing nicely and I pointed out to him the method by which this planting should be continued. A fence along the boundary of the Moloaa forest reserve was found to be in need of repair and upon investigation the matter was called to the attention of the holder of the lease which requires that this fence be maintained in good condition.

The boundaries of the proposed new forest reserve on the makai land of Wailua to include the Nonou ridge, where there yet remains a remnant of good native forest in need of protection for water conservation purposes, were thoroughly gone over and found to include the land which it is desirable to set apart.

TREE PLANTING.

Tree planting on government lands has continued with the setting out during the month on the Honolulu Watershed forest reserve of 755 koa trees in Manoa valley, and 800 silk oak and 500 swamp mahogany trees on the Kealia reserve, Kauai. The recent plantings here and in Makiki valley have also been gone over to clean out the weeds which have come up with recent rains.

ARBOR DAY.

Arbor Day was celebrated on November 16 and large consignments of trees were sent to the other islands for planting on this day. Owing to the half-holiday on the same day, on account of the Queen's funeral, the planting on Oahu was not so extensive as on former occasions.

A request has been received from the county engineer of the Island of Hawaii to look into the need for tree planting on the watershed area back of the town of Hilo in order to perpetuate the water supply. This matter will receive attention on my next trip to Hawaii.

FOREST FENCING.

The building of the fence between the government land of Laupahoehoe and the private land of Maulua within the Hilo forest reserve, Hawaii, in coöperation with the Kukaiau ranch, a distance of 2.78 miles, was completed on the first of the month. The very dry summer in this region delayed the operations due to the lack of water and an extension of time on the contract of two months, or until the end of the year, was granted for the completion of the remaining distance of 2.26 miles along the Piha boundary. Since May the tame cattle running loose in the forest reserve in this region have all been removed and over 30 head of wild cattle have been shot by H. Meyer and the Kukaiau ranch under permit from this office. This has tended already to improve forest conditions in this region.

The new fence on the boundary of the proposed Hauula forest reserve, Oahu, was inspected and found to be almost completed. One more small valley and a short stretch up the last ridge will complete the job which is being done by local residents.

MISCELLANEOUS.

On November 14 and 15 attempts were made in company with the President of the Board to reach Moku Manu off windward Oahu, one of the islands included in Rule IV, in order to place a sign on the island warning against the destruction of birds. Owing to heavy seas and engine trouble it was not found possible to reach the island.

A considerable part of my time during the month has been spent in compiling reports on new forest reserves and other matters which will shortly be presented to the Board for action.

Respectfully submitted,

C. S. Judd,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, December 11, 1917.

Superintendent of Forestry, Honolulu, T. H.

Dear Sir:—I herewith submit a report of the work done during the month of November:

NURSERY.

Distribution of Plants.

The distribution of plants, with the exception of a very few orders, were all for Arbor Day planting. A special report on Arbor Day is attached, which contains the number of trees distributed and other information.

COLLECTIONS.

Collections on account of plants sold	$.35
Rent of office building, Nursery grounds, September	35.00
Total	$35.35

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 500 pot grown. We have orders on file for 265,000 seedlings to be delivered within the next two months. We are getting all orders ready as quickly as possible.

Collections and Distribution of Seed.

The seeding season for most of the forest trees, and also a number of the flowering trees is now on, and the seed boys are busy collecting. From Mr. Van Valkenberg's place at Kunia we collected in one day over three pounds of clean seed of the eucalyptus citriodora and one pound of encalyptus amygdalina. The former is catalogued on the Coast at $22.00 per pound and the latter at $14.00.

We had the pleasure of a visit from Mr. George W. Hess, Superintendent of the United States Botanic Garden, Washington, D. C., who accompanied the congressional party. We conducted Mr. Hess to all the places of interest in and around the city. We also gave him a large package of seed containing many species, to take back with him.

Makiki Station.

The work at the Makiki Station has been principally routine. We have now gotten rid of a great deal of our surplus stock, and we will be busy at this station now for some time to get a fresh stock up again.

Honolulu Watershed Planting.

The work done on the watershed has consisted of hoeing and clearing away brush from the young trees, making holes for planting, etc.

Advice and Assistance.

The writer has made visits and otherwise given advice and assistance to people who have asked for same as follows: Visits made to places in and around city, 7; advice given by telephone, 10; advice given by letter, 6; advice given at Nursery, 11.

Respectfully submitted,

David Haughs,
Forest Nurseryman.

ARBOR DAY.

Honolulu, December 24, 1917.

Superintendent of Forestry, Honolulu, T. H.

DEAR SIR:—I herewith submit a special report on the distribution of plants for Arbor Day planting from the Government Nursery in Honolulu. The total number of plants distributed amounted to 10,490. This is only about one-half the number distributed for the 1916 Arbor Day. The decrease may be due to a number of causes, a few of which are as follows:

1. The school grounds are practically all planted, as far as trees are concerned.
2. The military posts have already planted about all the trees they desire.
3. As to the homesteaders, there have been no new tracts opened up and those homesteaders who have occupied their homesteads for several years have received during that time about all the trees they want.

Distribution of Plants by Islands.

Islands.	Plants.
Oahu	6,154
Maui	2,876
Hawaii	1,216
Kauai	244
Total	10,490

Included in the above total is the number of plants sent to the public schools of the Territory and distributed as follows:

Oahu	8	schools	374	plants.
Maui	10	"	297	"
Hawaii	13	"	431	"
Kauai	3	"	62	"
	34	"	1164	"

Reports just received from Bro. Mathias Newell of Hilo and Mr. Walter McBryde of Homestead, Kauai, give the number of trees distributed for Arbor Day planting as follows:

Bro. M. Newell, Hilo	334
Mr. W. McBryde, Kauai	1,287
Government Nursery distribution	10,490
Grand total	12,111

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, November 30, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

GENTLEMEN:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of November, 1917, as follows:

During the month there arrived at the port of Honolulu 49 vessels of which 22 carried vegetable matter, one of these vessels passing through the Canal Zone. The consignment consisted of the following:

Disposal	*Lots*	*Parcels*
Passed as free from pests	1505	45,166
Fumigated	8	18
Burned	77	78
Returned	2	3
Total inspected	1592	45,265

Of these shipments 44,838 packages arrived as freight, 223 packages as baggage and 204 packages as mail matter.

RICE AND BEAN SHIPMENTS.

During the month 15,231 bags of rice and 1,888 bags of beans arrived from Japan and Oriental ports, all of which were free from pests.

PESTS INTERCEPTED.

Approximately 6,122 pieces of baggage belonging to passengers and immigrants from foreign countries were examined and from these were seized and destroyed by burning 25 lots of fruits and 77 lots of vegetables.

The following disposal was made of plants and seeds from various sources:

November 1, one bag of abaca seed from Manila for the Hawaii Experiment Station was fumigated as a precaution.

November 5, 2 plants found in the baggage of a passenger from Japan were fumigated and the soil removed, in which we found a colony of ants.

November 14, 2 crates of boxtrees from California by express were fumigated. Several garden snails (Helix aspersa) were found among the packing.

November 20, 3 packages of staghorn ferns came by freight from Sydney, Australia, also one large fern stump. The ferns

were fumigated as a precaution, but the large stump was refused entry as it showed indications of borers.

November 24, 1 package of Japanese poha fruit was found in the mail and was returned as contraband.

Two small ornamental plants were found in the baggage from Japan; they were fumigated and all soil removed before delivery. Two packages of tree seed, found in the baggage, were burned as well as a five-needle pine tree, the last being prohibited entry into the United States.

November 30, a package of pine trees from Japan was seized and destroyed by burning.

HILO INSPECTION.

Brother M. Newell reports the arrival of six steamers and one sailing vessel with lumber. Two of the steamers carried vegetable matter consisting of 161 lots and 3120 packages. All shipments were passed as free from pests except one sack of turnips which was destroyed on account of being infested with the radish maggot.

KAHULUI INSPECTION.

Mr. Edwin C. Moore, acting Fruit and Plant Inspector for Maui, reports the arrival of 6 vessels at the port of Kahului, two of which brought vegetable matter consisting of 13 lots and 699 packages, all of which were passed as free from pests.

INTER-ISLAND INSPECTION.

Fifty-seven steamers plying between Honolulu and other island ports were attended to, and the following shipments were passed as free from pests:

Taro	571	bags
Vegetables	297	packages
Plants	218	packages
Fruit	18	packages
Total inspected	1104	packages

Seven packages of plants and eleven packages of fruit were seized and refused shipment on account of infestation and undesirable soil.

I beg to inform you that Mr. Will J. Cooper has returned from the training camp and will resume his duties of Plant and Fruit Inspector at Kahului beginning December 1, 1917.

Respectfully submitted,

E. M. Ehrhorn,
Chief Plant Inspector.

Division of Entomology

Honolulu, November 30, 1917.

Board of Commissioners of Agriculture and Forestry, Honolulu.

GENTLEMEN:—During the month of November the insectary handled 29,400 pupae of the melon fly, from which there were bred 703 females and 675 males, *Opius fletcheri.*

The distribution of parasites was as follows:

Opius fletcheri.

	Females	Males
Oahu—Honolulu:		
Makiki	30	30
Kailua	525	555

Tetrastichus.

Oahu: Kalihi	700

Diachasma fullawayi.

Oahu: Kalihi	85	25

Diachasma tryoni.

Oahu: Kalihi	425	240

Paranagrus (Corn Leaf Hopper Parasite).

Oahu—Honolulu:	
Makiki Nursery	7700
Kailua	2600
Maui—	
Haiku	3200

Very respectfully,

DAVID FULLAWAY,
Entomologist.

Division of Animal Industry

Honolulu, November 30, 1917.

Dr. Victor A. Nörgaard, Chief, Division of Animal Industry, Board of Agriculture and Forestry, Honolulu, T. H.

SIR:—I have the honor to submit the following report for the month of November, 1917:

TUBERCULOSIS CONTROL.

The following dairy cattle were tested during the past month:

	Tested.	*Passed.*	*Condemned.*
S. I. Shaw	32	23	9
Girls' Industrial School	10	10	0
M. Nee	33	32	1
S. Shidara	4	4	0
C. Ikeda	28	27	1
K. Inouye	44	44	0
P. Miyakawa	13	13	0
Mrs. C. M. Cooke	11	11	0
E. W. Jordan	2	2	0
C. W. Lucas	1	1	0

The above tabulated list gives a total of 178 head tested, out of which number 167 were passed and 11 condemned and branded.

Besides the above testing, post mortem examinations were made at the local abattoirs on 113 head of cattle condemned for tuberculosis. Lesions of varying extent were found in all animals, but in only one animal were they extensive enough to warrant the condemnation of any parts; in this case both fore quarters were condemned as unfit for human consumption.

Quite a large number of cases of open tuberculosis of the lungs were found among these animals. Such animals have acted as "spreaders," which accounts for the large percentage of infected animals found in some localities.

All the above condemned animals were appraised according to the provisions of Act 121, and the owners have received their full amount of compensation.

IMPORTATIONS OF LIVE STOCK.

S. S. Makura, Vancouver: 1 large crate white leghorns, Mrs. L. M. Ross.

S. S. Lurline, San Francisco: 58 Holstein cows, 1 Holstein bull, 4 Berkshire hogs, 1 ct. poultry, W. E. Bellina; 1 Berkshire sow, L. K. Smith; 5 Holstein cows, 1 Holstein bull, Lahainaluna School; 30 cts. poultry, various.

S. S. Wilhelmina, San Francisco: 1 dog, W. J. White; 1 cat, Mrs. J. Hickey; 5 cts pheasants, F. F. Baldwin.

S. S. Tenyo Maru, Orient: 1 dog, S. Shigemoto.

S. S. Hyades, San Francisco: 47 Holstein cows, 1 Holstein bull, 1 Berkshire boar, C. H. Bellina.

S. S. Manoa, San Francisco: 13 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Marketing Division

Honolulu, December 15, 1917.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

GENTLEMEN:—I have the honor to submit herewith the financial statement and report of the Superintendent of the Territorial Marketing Division, for the five months ending November 30, 1917:

Since July first, the consignment sales of the Division have been very good and, through the commission earned on these sales and the surplus on hand, it has been possible to pay off all but $500 of the note for $3,000 owed on July 1, 1917. The last payment will be made in December. A surplus should then be accumulated to cover the fixtures, autos, etc., listed as assets.

Due to the lack of equipment, poor location of the Division for retailing, and the uncertainty of the supplies that could be sold at retail, the retail departments have not been paying expenses and, with the consent of the Board, they were closed on November 30. The closing of the retail departments will in no way affect the sale of island produce consigned to the Division for sale. In fact it should give the Division more time to sell island produce to wholesalers and the Army at less expense to the Territory and with as good returns to the producer. The force of employees will be reduced to the actual needs of the consignment department at once.

The pineapple crates are being sold just as fast as they can be brought in from Aiea and Wahiawa where they have been stored. When these crates are all sold, the account will probably show a small loss due to the crates rotting while in storage of the Bureau of Immigration and the necessity of selling some of them for less than cost in order to dispose of them. This loss could be made up from earnings. The Attorney General's office states that suit will be brought shortly to collect a claim of $1651.61, due this account from F. E. Haley. This claim and a few other small

non-collectable claims are included in the reserve for doubtful accounts.

There was not as great a demand for seed from the Division as was anticipated by the last legislature when it made an appropriation of $2500 and as a consequence there was a lot of seed left on hand at the end of the 1917 planting season.

With the Governor's approval $688.40 worth of seed was turned over to the Army for the Post garden at Wahiawa on the understanding that the seed was to be paid for out of the crops, if any, either in cash or produce. A report has been requested from the Army on this matter. The other seed on hand is getting old and losing its germination, and I would suggest that it be distributed free of charge if need be in order that it may be of some use to the producers.

The deficit shown in Schedule "C" of the financial statement includes all expenditures from the Territorial expense appropriations and does not represent losses.

Due to the inability of our largest dressed meat consignor to make regular shipments, the consignment sales for December will probably be considerably less than the average for the past few months. There will be a large crop of beans, however, which should be handled by the Division.

Respectfully,

A. T. Longley,
Superintendent.

SEGREGATION OF PRODUCE RECEIVED BY THE MARKETING DIVISION DURING THE MONTH OF NOVEMBER, 1917.

Articles:	Total	Oahu	Hawaii	Maui	Molokai	Kauai
Avocados	504	..	504	..	..	..
Bananas, bches.	475	475	..	..	..	..
Beans, dry, sacks	156	1	4	151	..	..
Beef, dressed, carcasses	119	5	1	107	6	..
Butter, pounds	45	45	..	..	..	..
Cabbage, pounds	954	242	712	..	..	..
Chickens	210	112	..	51	47	..
Chinese squash	10	10	..	..	..	..
Cooking bananas, bches.	6	..	6	..	..	..
Corn, dry, sacks	370	..	..	370	..	..
Ducks	101	89	12	..	..	..
Eggs, dozen	33	33	..	..	..	..
Egg plant, dozen	9	9	..	..	..	..
Ginger, pounds	80	..	80	..	..	..
Grapes, pounds	317	127	190	..	..	..
Hides	10	8	1	..	1	..
Hogs	16	5	7	4	..	..

Articles:	Total	Oahu	Hawaii	Maui	Molokai	Kauai
Lemons	418	418	..	..	..	..
Limes	2357	707	1300	..	350	..
Oranges	4896	460	4436	..	..	..
Papaia, pounds	66	66	..	..	..	..
Peppers, sacks	1	1	..	..	..	..
Pigs, dressed	9	..	9	..	..	..
Pineapples, pounds	1720	1720	..	..	..	..
Pohas, pounds	1158	..	1158	..	..	..
Potatoes, white, sweets sacks	149	149	..	..	..	..
Pumpkins	112	109	3	..	..	..
Taro flour, pounds	30	30	..	..	..	..
Turkeys	12	6	..	..	6	..
Tomatoes, pounds	940	940	..	..	..	..
Veal, dressed, carcasses	25	6	2	16	1	..
Yams, red, sacks	10	10	..	..	..	..

How the work of the Forest Service was realigned to meet war conditions is described in the annual report of the Forester, made by acting Forester A. F. Potter. The report also states that practically every form of use of the forests was greater than ever before, that the receipts again touched a new high level with a total of $3,457,028.41, and that the increase in receipts over the previous year was $633,487.70.

Under the provisions of the national forest section of the Federal Aid Road Act approximately $1,410,000 of Federal Aid road money is available during the next ten years, at the rate of $141,000 a year, for the construction of roads and trails within the national forests of California. In each case, under the terms of the Act, the road funds must be derived partly from local sources.

A 14-lb. Christmas box for each member of the Forest Service from California in France with the 10th Engineers, the Lumberjack and Forestry regiment, was shipped from the San Francisco office of the Forest Service. Each box contains candy, tobacco, cigarettes, toilet articles, raisins and dates, a pipe, deck of playing cards, a book, and a waterproof match safe. These boxes are being sent by former associates of the men in the Forest regiment.

The yucca plant or Spanish bayonet, common in the hills of southern California, is now being used for the manufacture of brooms. Another species of the yucca is used for the manufacture of surgeons' splints, and is being experimented with for use as artificial limbs.

The common manzanita bush, grown everywhere in California, may be of value in dye-making. A carload of stems and roots

was recently shipped from northern California to an eastern dye manufacturer for experimental purposes.

The root swellings or burls of the wild lilac are proving valuable as a substitute for briar in the manufacture of tobacco pipes.

Bay rum, used in toilet preparations, is manufactured from the California bay tree, and quinine is produced from the wild quinine bush that grows widely over the southern deserts.

On December 5, 1917, a proclamation was signed by the President eliminating approximately 431,000 acres from the Sequoia national forest, California. The greater portion of the lands eliminated comprise three large tracts situated at the southern end of the forest. Of the entire area eliminated from the forest about 20,000 acres are shown by the classification reports to have agricultural value, and it is believed that considerable of this land will be filed upon in the near future.

THE MANGROVE IN THE HAWAIIAN ISLANDS.

By Vaughan MacCaughey, *College of Hawaii.*

One of the most abundant and characteristic trees along tropical and subtropical coasts, throughout the world, is the mangrove. This tree possesses a number of highly interesting peculiarities. It grows in salt water. It forms impenetrable thickets with its branching ærial roots. It does not have true seeds, but is viviparous, and the young plants are remarkably adapted for life in their marine nursery.

The mangrove is a notable land-builder. It has added thousands of miles of *terra firma* to the coast lines which it inhabits. The writer, who has been interested for the past decade in the natural history of Hawaii, has often deplored the absence of mangrove swamps in the Hawaiian Archipelago, both from the economic standpoint, and from the standpoint of the general natural history interest of such a life zone. The absence of the mangrove from Hawaii is another evidence of the profound isolation of this archipelago through long periods of time. The coasts of the Hawaiian Islands, both naturally and as a result of the devastations of man and his live stock, are singularly barren of arborescent vegetation.* There are extensive areas, particularly on the islands of Kauai, Oahu, Molokai and Maui, that are admirably adapted to the mangrove, and that would be greatly benefited by the presence of this valuable land-building tree.

The mangrove tree is not generally known to be introduced into the Hawaiian Islands. The writer by chance discovered a

* See MacCaughey, Survey of the Hawaiian Land Flora, Botanical Gazette, August, 1917.

fine specimen growing in a fish pond, at the Kalihi Farm, near Honolulu, belonging to the Alexander Young Estate. This tree was planted by Mr. Allan Herbert, many years ago, and is now in flourishing condition. So far as is known to the writer, it is the only tree on the Island of Oahu. Under the direction of Mr. George Cooke there have been extensive plantings of mangrove along the shores of the Island of Molokai. The trees were planted as a source of floral honey, as Molokai is a noted honey-producing region. The trees are spreading and seeding and rapidly becoming thoroughly naturalized. The mangrove is not mentioned by Hillebrand, or by any other of the many botanists who have visited and written of the native and naturalized plant life of Hawaii. The tree specified is not only in vigorous growth, but has produced many seedlings which have evidently become thoroughly naturalized. The evidence strikingly corroborates the writer's previous conviction as to the Hawaiian possibilities of the mangrove.

The family Rhizophoraceæ, of which the mangrove is characteristic, comprises 15 genera and about 50 species. Prominent among the genera are: *Weihea*, 12 spp., Old World tropics; *Ceriops*, 2 spp., Old World tropics; *Pruguiera*, 5 spp. tropical Asia and East Africa; *Anisophyllea*, 5 spp., Old World tropics; *Poga*, 1 spp., Africa. *Rhizophora* has 3 species, *mangle*, of tropical America and West Africa; *mucronata* and *conjugata*, of tropical Asia and East Africa. These three are widely distributed on the shores of tidal marshes and estuaries. The generic name is from the Greek, root-bearing, and was used by early writers to designate various climbing plants with aerial roots.

The genus is almost unique in the plant world because the seeds have no true resting period, that is, they germinate at once on the plant. The radicle may reach a length of 3 feet, although usually less; it is club-shaped and heaviest at the apex, so that when the seedling finally falls from the tree, it sticks vertically in the mud, with the radicle down, ready to grow. This is one of the best examples of vivipary, as the embryo continues in a state of uninterrupted development from the outset. This is essentially seedlessness, from the physiological standpoint, and germination, in the usual sense, does not take place. This habit is of obvious usefulness, facilitating both the wide dispersal and abundant reproduction of these plants, as is testified by the extensive coastal mangrove swamps throughout the tropics. This extraordinary combination of structural and ecologic characters—vivipary, aerial roots, ability to grow in salt water, rapid lateral growth, and freedom from fungus and insect pests—has given to the mangroves a tremendous advantage in the invasion of tropical coasts.

The name mangrove is derived, by corruption, from the original Malayan name *mangi-mangi*. The American species, *R. mangle L.*, is called Red Mangrove, referring to the color of the inner bark. There are various trees in other regions that are

called mangrove, that are not true mangroves, and do not belong to the mangrove family. The White "Mangrove" is *Laguncularia racemosa* of tropical America. The Black Mangrove is *Avicennia nitida*, also of tropical America, and sometimes called Olive Mangrove. The Mangrove Myrtle is *Barringtonia acutangula*, of the East Indies. The Milky Mangrove is *Excaccaria agallochum* of Australia. The Tasmanian "Mangrove" is *Acacia longifolia*. The River Mangrove is *Aegiceras majus*, of Indo-Malaya and Australia.

The American mangrove, which is the species represented in the Hawaiian Islands, is abundant along the coasts of Florida, tropical America, the West Indies, and the Galapagos Islands. It forms vast, monotonous green thickets, and is the van of advancing vegetation along the salt marshes. Its maze of roots make it an effective land builder, and it rapidly gives a foothold to less hardy species. In West Indian waters, for example, mangrove islands are formed so rapidly that in a few years they dot the shallow waters of bays which were formerly destitute of them.

The tree is round-topped, bushy, and usually 15-20 feet high. Its branches are spreading, like those of the *hau*, and its roots make almost impenetrable thickets. Sometimes, in inland situations, the tree grows erect, attaining a height of 70-80 feet, with a fine tall straight trunk, 3-4 feet in diameter, and clear of branches for more than half its length. These trees, of course, yield the best timber. Normally, however, the tree is squat and broad, and as it grows it throws out great numbers of ærial roots, which brace it well on all sides, like those of the Pandanus or Banyan, so that the waves and tides cannot dislodge it. The roots branch profusely in the air and spread out laterally, forming a dense network. They are of special importance in supporting the numerous branches, as in most cases the basal part of the primary trunk has an early death. The roots themselves are very stem-like in internal structure. The æerial roots or pneumatophores comprise an interesting feature of this tree. These are erect or kneed branches of the roots, which project above the mud, and are provided with stomata and lenticels, into which air passes freely and is then carried by means of passages in the soft spongy tissues to the underground roots. Like certain other aquatic plants, the mangrove develops intercellular or internal hairs in its air-passages. These hairs are of ecological significance in connection with the fluctuations in the air-supply, which varies greatly, of course, with the rise and fall of the tides.

The bark is at first smooth, reddish brown, becoming .35-.50 inch thick, and gray faintly tinged with red. The surface is irregularly fissured into low close ridges, these again are transversely broken into thin appressed scales, giving a very characteristic appearance to the old bark. The bark is red inside. It is rich in tannin, and is used for tanning leather, and also in dyeing. The Florida Indians formerly used the copious bast for

an excellent cordage. A decoction of the bark is used by the natives of tropical America as a febrifuge.

The wood is very heavy, weighing 72.40 lbs. per cubic foot of seasoned wood. It is very hard, tough, strong, and durable. It is close-grained, and takes a beautiful satiny polish. The heartwood is dark-reddish-brown streaked with lighter brown; sometimes it is almost black. The sapwood is pale, with 40-50 seasonal rings. The pith rays are thin and broad; the ducts are open and diffuse. The following table will show the mechanical properties of the wood:

Specific gravity	1.617
Percentage of ash	1.82
Relative approximate fuel value	1.1406
Coefficient of elasticity	165567
Modulus of rupture	1207
Resistance to longitudinal pressure	860
Resistance to indentation	462

The wood makes an excellent fuel. As it is not attacked by teredos, it is sometimes used for wharf pilings. It also has been used for flooring. The mangrove, however, grows in situations that render very difficult the cutting and transportation of the wood, and it is of little commercial importance.

The young branches are stout, terete, conspicuously marked by the large, oval, slightly elevated leaf-scars. The leaves are opposite and stipulate. The stipules are interpetiolar, lanceolate, acute, 1.5-2 inches long, glabrous, light green, infolding the bud, and deciduous as the leaf unfolds. The terminal bud is strong and conspicuous. The leaves are 3.5-5 inches long and 1-2 inches wide. The petioles are 0.5-1.5 inches long, smooth, light green, and flattened. The blade is oblong, oval, or elliptical. It is glabrous, thick, and coriaceous. The apex is rounded or acute; the base is cunette, narrowing gradually. The margin is entire and slightly thickened. The upper surface is dark green and very glossy; the lower surface is pale, but veinlets are rather obscure, reticulate. The leaves are persistent for 1 or 2 years. It is interesting to note that the old leaves serve as water-storage organs. The old, yellowish leaves are twice as thick as leaves which have just attained their full size, and the former are notably charged with water.

The flowers are small, dull colored, and not particularly conspicuous. They are produced continuously throughout the year in the axils of the young leaves. They are borne on stout 2- or 3-branched peduncles 1.5-2 inches long. Each pedicel is subtended by a 2- or 3-lobed involucral cup at the end of the peduncle. Each flower has 2 short bracelets united in an involucral cup. The flowers are perfect, regular, and when fully expanded are about 1 inch in diameter. The calyx is coriaceous; lobes 4; 2-3 times as long as the turbinate, globose tube; each lobe acute, thickened at the margins and with a median rib on the inner sur-

face; persistent; reflexed at maturity. The petals are 4; induplicate in the bud; inserted on a fleshy disk-like ring in the mouth of the calyx tube; nearly linear, cleft at the tip; pale yellow; coated on the inner surface with long pale hairs; reflexed between the calyx-lobes at maturity, and early caducous. The stamens are 8-12 in number, in 2 sets; filaments vollose, very short or none; anthers attached at the base, elongated, introrse, connivent, and areolate. The ovary is conic, partly inferior, and 2-loculed. There are 2 awl-shaped, spreading styles, stigmatic at their tips. The nectaries are well-developed, and the flower is an important source of honey.

The fruit is berry-like, 1 inch long, conical, rusty-brown, leathery, and slightly studded with minute bosses. It is normally 1-celled and 1-seeded. It is subtended by the persistent reflexed calyx-lobes, and perforated at the apex by the germinating embryo. The fruit is said to be sweet and edible, and its juice, when fermented, yields a light wine. The apex of the seed is surrounded by a thin, albuminous, cup-like aril. The cotyledons are dark purple. The embryo is surrounded by a thin coat of albumen. The seed coat is thick and fleshy.

As already has been indicated, the viviparous habit is one of the remarkable features of the mangrove. The embryo has no true resting period. Upon the maturity of the fruit the cotyledons develop as a slender, hard, woody, thick-walled tube, protruding 0.5-.75 of an inch beyond the apex of the fruit. The plumule is enclosed within this tube. The radicle is elongate and club-shaped and grows pendulously from the tube. It is dark-brown, marked with occasional orange-colored lenticels. It rapidly enlarges and becomes the most conspicuous part of the reproductive mechanism. When mature it is 10-12 inches or more long, and .25-.35 of an inch in diameter near the apex. It drops from the cotyledon tube which has supported it. The heavy, club-shaped apical end sticks into the mud, and the lighter basal end, bearing the plumule, is uppermost. The plumule is thus held above the surface of the shallow water; the radicle strikes root; and the seedling quickly establishes itself. If the water is deep, or there are currents, the nautical seedling may float unimpaired for great distances before finally reaching shallow water where conditions permit a continuation of its growth processes.

There is abundant evidence that the mangrove, if once suitably established on the shores of the Hawaiian Islands, would in time become one of Hawaii's most important littoral trees.

Editor Hawaiian Forester.

Dear Sir:—Will you please append the following statement, by Mr. George P. Cooke, of Molokai, to my article upon the Mangrove in Hawaii. In kind response to my inquiry, Mr. Cooke wrote December 15 in part:

"In reply to your favor of recent date re mangrove trees, will

say that the first trees planted on the Molokai Ranch were set out before I came to the ranch in 1908. One of our men, Mr. James Munro, informs me that they were set out about the year 1905. The trees are from seed that came from Florida. They now cover thinly about one mile of the shore. The planting of the trees was for the purpose of holding back soil that is being washed down by every heavy rain into the sea, and also as a pasture plant for bees. I do not know of any other trees in the Islands. In 1908 shortly after I came to Molokai we received a lot of seed of the Philippine mangrove. These had been shipped on a transport but were not landed till the steamer returned to Honolulu from San Francisco. None of these germinated.

"I have found volunteers from our trees growing along the shore about five miles away. And the other day I found two healthy seeds on our windward shore, to reach which the seeds must have drifted on the currents at least sixty miles."

THE PINEAPPLE GUAVA.

A DELICIOUS SUBTROPICAL FRUIT.

By Vaughan MacCaughey, *College of Hawaii.*

The true guavas (*Psidium*) are widely known and enjoyed throughout tropic and subtropical regions, both as fresh fruit and in the form of jam, jellies, etc. Closely related to them, however, is a little-known species, the Pineapple Guava, *Feijoa Sellowiana.*

This species is native to subtropical South America, particularly western Paraguay, southern Brazil, Uruguay, and parts of Argentina. In these countries it is common in the forests. Although not cultivated by the natives, the fruit is highly prized by them. The designation Pineapple Guava refers to the flavor of the fruit, which strongly resembles that of the pineapple. It is also called Brazilian Guava or Fig Guava. It is not listed in Wilder's book on Hawaiian fruits.

It was named by Berg (Martius, Flora Braziliensis XIV, 1, p. 616, 1858), after material collected by Friedrich Sellow in Brazil. The genus was dedicated by Berg to Joam de Silva Feijoa (correctly pronounced fay-zhó-a), director of the Museum of Natural History at San Sebastian, Brazil. The first complete and accurate description of the species was not made until forty years later, by Dr. Edouard André, in Revue Horticole 70:265, 1896. Two other species have been described—*F. obovata* Berg and *F. Schenckiana* Kiaersk, but the fruit of both these are unknown. The genus is closely allied to *Psidium*, but distinguished from it by albuminous seeds and stamens suberect in the bud.

The only general account in the American literature is that of F. W. Popenoe, in the Pomona College Journal of Economic Botany 2 (1912) No. 1, pp. 217-242, 13 figs., but this journal had a limited circulation and has been defunct for several years. The

fruit was unknown in the Hawaiian Islands previous to 1908, and the present account is the first to emphasize its possibilities in this Territory of the United States. It is cultivated in the Hilo region, Hawaii. The College of Hawaii has nursery plants.

The Pineapple Guava was introduced into Southern Europe in 1890, and is grown in southern France and Italy. From Italy it was introduced into the United States in 1900. It has been widely planted in California; in 1908 the Hawaii Agricultural Experiment Station received plants from southern California, and these have grown satisfactorily. The tree itself is well adapated for use as an ornamental and as a hedge-plant; the fruit is of unusual horticultural promise. There are now on the market several named varieties, of which André, Hehre, and Besson are the best known.

The shrub attains a height of 10-15 feet. Very old plants may have a total spread of 18 feet or more, with trunks 8-10 inches thick at the base. The branches are rounded and swollen at the nodes. The bark is light gray; the entire plant, with the exception of the upper surfaces of the leaves and the corollos, is covered with white tomentum. The leaves are opposite, short petioled, thick and coriaceous. They resemble those of the olive, but are much larger. The upper surface is dark glossy green; the lower surface is silver gray, canescent and finely pubescent. The striking contrast in the two surfaces constitutes one of the ornamental features of the plant. The margins are slightly recurved. The veins are inconspicuous on the upper surface of the blade; below they are fine, prominent, and in arcuate reticulations, re-uniting before reaching the margin of the leaf.

The flower buds are globular, puberulent, and constricted above the ovary. The flowers are showy (1-1.5 inches diameter), red, white and purple, bisexual, and solitary or in clusters. They appear in late spring. The pedicles are 1-flowered at the ends of the branches or becoming lateral. They are at first straight, then recurved, .50-.75 inch long, whitish and velvety. The calyx tube is turbinate. The sepals are 4, unequal, obtusely elliptical, recurved; pubescent, and ciliated. The petals are 4, spreading, thick and fleshy, ovate or obovate, entire or emarginate, obtuse, glabrous and ciliated. They are cupped, white on the outside and purplish crimson within. After anthesis they become recurved. They have a sweet flavor.

The stamens are numerous, perigynous, erect in a large cluster of many series, about 1 inch long. The filaments are showy, filiform, deep purple or crimson red. The anthers are globular and yellow. The style is longer than the stamens, filiform, and with a capitate stigma. The ovary is 4-celled, oblong, turbinate. The flower as a whole is very attractive, with plentiful nectar, pollen and aroma; a bush in full blossom is handsome to a marked degree.

It has been demonstrated that the flowers of the Pineapple Guava are largely self-sterile, and although isolated plants are not infrequently productive, it is good horticultural practice to

plant two or more bushes together so as to permit cross-pollination. For a detailed statement of these investigations see K. A. Ryerson, in University of California Journal of Agriculture 2 (1914) No. 2, pp. 51-53.

The fruit is a berry, oblong or oval, 2 inches long and 1.5 inches in diameter (there is considerable variation in size), with 4 many-seeded locules. When mature it is characterized by a delicious penetrating odor. The surface is at first tomentose, then smooth. The fruit is crowned by the thick disk and cupped sepals of the persistent calyx. The skin is much indented, slightly and unequally furrowed, but upon maturity becomes smooth. In color it is dull green, sometimes flushed with crimson on one side. The green color is retained at maturity. The flesh comprises a firm, whitish, granular layer which surrounds the central pulp. This pulp is thick, creamy yellow or translucent, and melting. It possesses a delicious flavor, strongly resembling that of the fully matured pineapple, with a rich heavy bland perfume. In the pulp are 20-30 very small oblong seeds, so small as to be unnoticed in eating the fruit, and contrasting with the seedy interior of the common guava.

The fruit should not be picked until it is fully mature. It ripens in autumn and early winter, and falls to the ground upon maturity. The ripe fruit should be laid in a cool place until ready for eating. Little care is required in packing; the fruit is an excellent shipper if it is kept cool. It quickly spoils in a hot, humid atmosphere, but can be kept for a month or more if suitable conditions are maintained. The fruit is not only delicious when eaten out of hand, but also can be cooked, crystallized, and made into jams or jellies.

A notable feature of the Pineapple Guava is that it grows better under subtropic conditions than in strictly tropical regions. It is hardier than most of the fruits found in the Hawaiian Islands, such as the mango, avocado, papaia, etc. The best climate for the Pineapple Guava seems to be one free from excessive moisture and cool for at least a portion of the year. In France the Pineapple Guava has passed uninjured through temperatures of 12° F. It would probably thrive in the upland regions of Maui and Hawaii, as well as on cool parts of the Kauai and Oahu lowlands. The plant is notably drought resistant, and contrasts strongly in this respect with many other tropical fruits. It requires very little pruning or other attention.

Propagation is usually by seed, which comes fairly true. The seedlings come into bearing in 3-5 years. Cuttings of the young wood are successfully rooted under glass, with bottom heat, although they root very slowly. Layering is used in France and other parts of southern Europe to propagate choice varieties The layers root in about six months.

The Pineapple Guava offers very attractive possibilities to all who are interested in tropical and subtropical horticulture. There is no question but that in time it will make for itself a large and unduplicated place in the horticulture of the Hawaiian Islands, southern California and tropical Florida.

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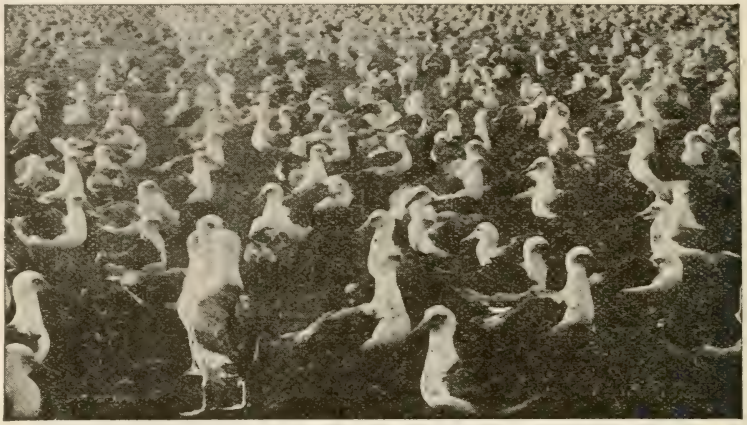
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